JUNE 1959

Utility engineering section begins on page 47

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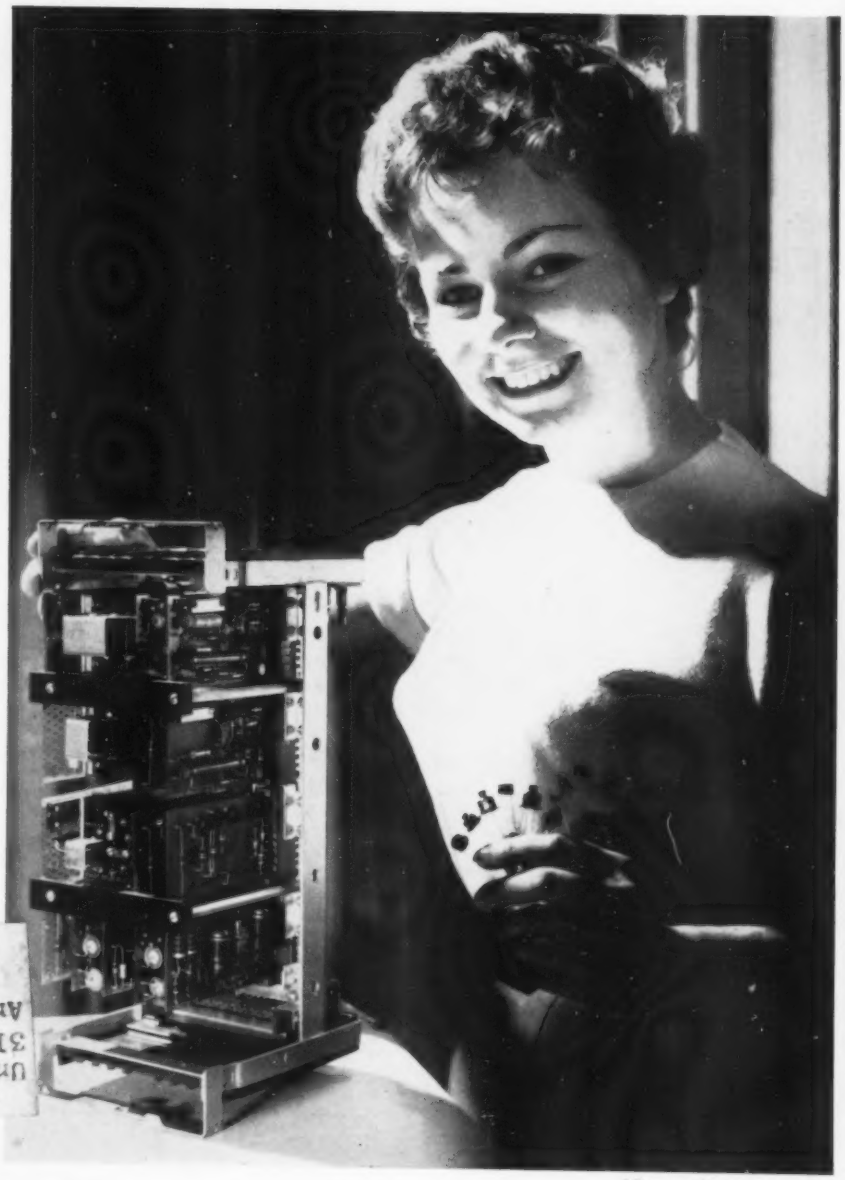

(Cover story, page 68)

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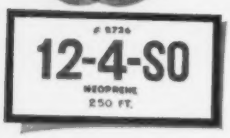

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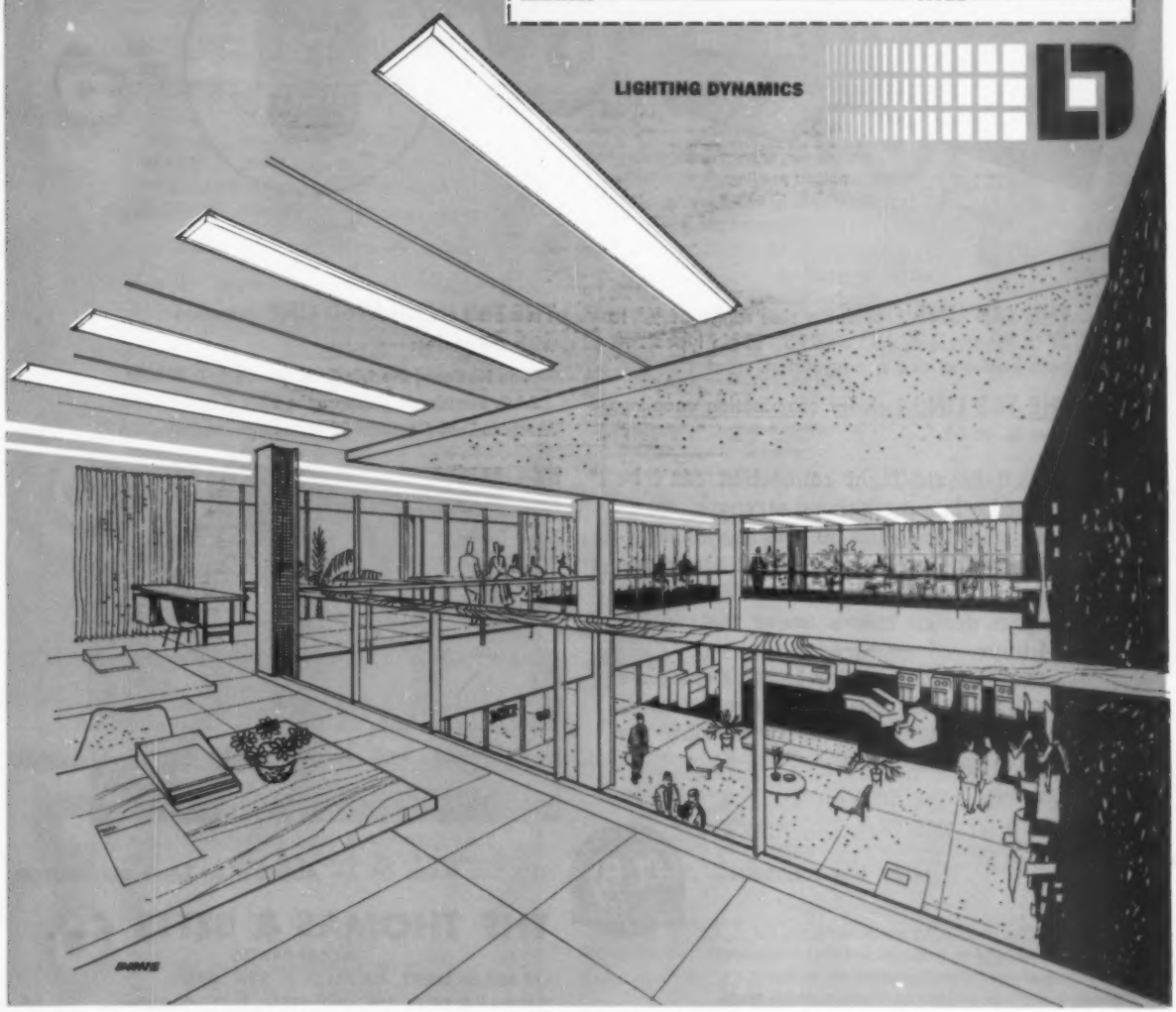

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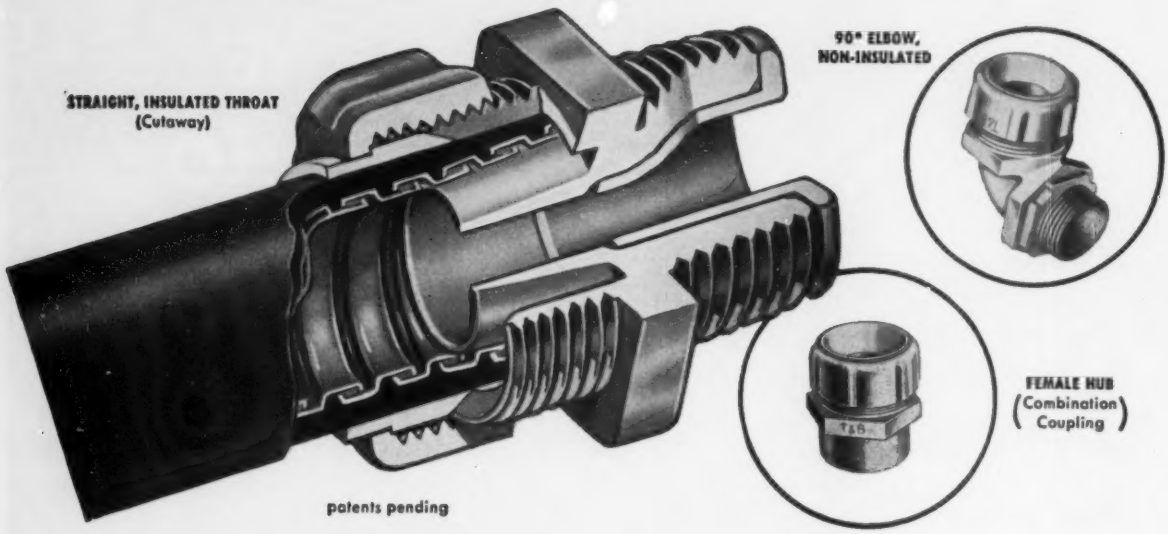

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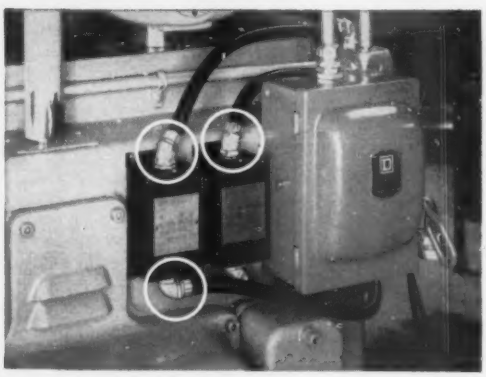

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In this issue

Concrete industry converts to electronic control 22
Shortcuts that help to reduce overhead 24
Joints NECA-IBEW Southwestern convention 26
Comment on electrical inspections and inspectors 30
Partnership selling program stresses teamwork 32
New ideas in economical tool houses 34
Equipment displays save contractor's time 36

Utility engineering

Utility enginering section 47
Aerial cable in modern distribution systems 56
Planning underground networks in small towns 58
Spliced poles reduce cost in street lighting 59
Primary voltages of the future 60
Distribution transformer has more loadability 62
Lighting for outdoor substations 63
Georgia's automated transformer plant 64
Relays without moving parts 68
Parallel operation of regulators 74
NEMA wire-cable group meeting 82
New utility equipment 86

In every issue

Economic comment 6
Washington report 10
Catalogs and bulletins 12
Postage-paid inquiry card 19
Know the law 99
Understanding the Code 100
Estimating data sheets 106
News of the industry 108
Dates ahead 112
Technical books 114
Helpful literature from manufacturers 116
New electrical products 118

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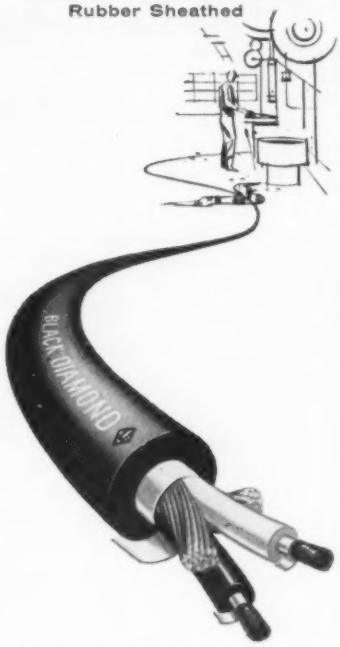

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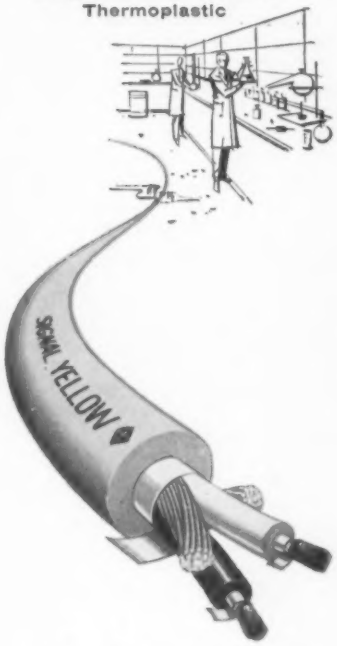

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

Forecasting again

Now that 1959 is half over, it is possible to evaluate economic gains to date and to prophesy, with some degree of accuracy, the changes that lie ahead. It is always a dangerous game, this forecasting, but by careful weighing of all factors presently foreseeable a fairly healthy final six months appears in view.

The biggest problem that has been present since 1958 was the larger than usual unemployment figure. This was the hurdle that had to be overcome before it was possible to forecast economic progress with any degree of accuracy. The latest figures released recently by the Federal Government indicate a real breakthrough in overcoming the plaguing unemployment problem.

Unemployment has at last shown a greater than normal decline, something in the neighborhood of a one million person decline. Now, with these persons back in productive jobs, it would appear that business improvement should continue on into 1960 and perhaps considerably beyond.

Many economists now are forecasting the birth of a new business boom that will reach well into the middle of the next decade. This optimism can be borne out quite factually if the influential factors are analyzed. Personal income continues to rise to new heights; population increase with all of its consequent demands seems to continue to explode; new products, based upon scientific achievement and technical advance, are making many of the nation's present durable goods obsolete; the rate of productivity per man now continues to advance although not quite fast enough to forestall the gradual inflation that appears to be a permanent part of the economic scene; and finally, there is a growing air of optimism replacing the fears of a decline that invaded the planning of many persons during the depressed period of 1958.

All of these factors when examined in detail are indicative of the upsurge now seen on all sides. The basic questions now are how far, how much, and what if anything might enter the picture and upset the economic timetable.

Inflationary pattern

Referring to the first two questions raised it might be well to say that by 1965, gross national product (the economic measure of our annual productivity) should rise to the six hundred billion dollar mark and perhaps beyond. Part of this dollar value increase will be caused by rising prices under the present inflationary pattern. Yet there is adequate reason to believe that the major portion of this productive advance can and will be based upon the true production of real value.

There is no reason to believe that public, governmental and industrial forces will not continue to strive to hold the line against inflationary forces. President Eisenhower has officially gone on record as opposed to any business action that could add to the inflationary spiral. His views have been echoed, yet even more forcefully, by Vice-President Nixon. Other governmental leaders seem to be just as insistent on a sane course of price stabilization.

A strong influence could be the attitude of business leadership if it vigorously opposes any and all pressures for an upward surge of prices and other inflationary factors. This type of action will demand, however, dedication to the public good as well as a courageous and unified stand against those who might press for personal and immediate economic gain. One of these pressures is certainly the avowed intention of labor leaders to reach for wage gains this year.

Labor unions have made great strides in recent years in advancing the causes of their membership' although other factors have also influenced progress made by the working men and women of the nation. This is a time, however, for good citizenship and public welfare to be the goals of intelligent labor leadership if gains made to date are not to be lost and the economy of the nation disrupted. What union leadership will do in face of the inflation peril is the great imponderable in prophesying economic advance at this time.

Last month this column indicated the great influence that the current steel wage negotiations would have on the economy as a whole. Since steel in its many forms is so vitally inter-related to all phases of production, the decisions here will have powerful and lasting impact upon the whole economic picture of the nation. That is why so many persons in this nation hope that union leadership in this industry will bargain, not for personal prestige and gain, but with an eye towards the national welfare and for the well-being of the millions of Americans whose lives will be influenced by the decisions reached by the negotiators.

Crossroads reached

At the time of this writing there is little reason to believe that an honest consideration has been given to the position of the public by either party to the negotiations. It is still too early to assess the probable results of these negotiations but there is cause for concern.

There is one very grave decision that must be made at the bargaining tables this year, whether it be the steel negotiations or those of other industries. A protracted labor strike in any of the basic industries will set back the timetable of economic advance that

(Continued on page 133)

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

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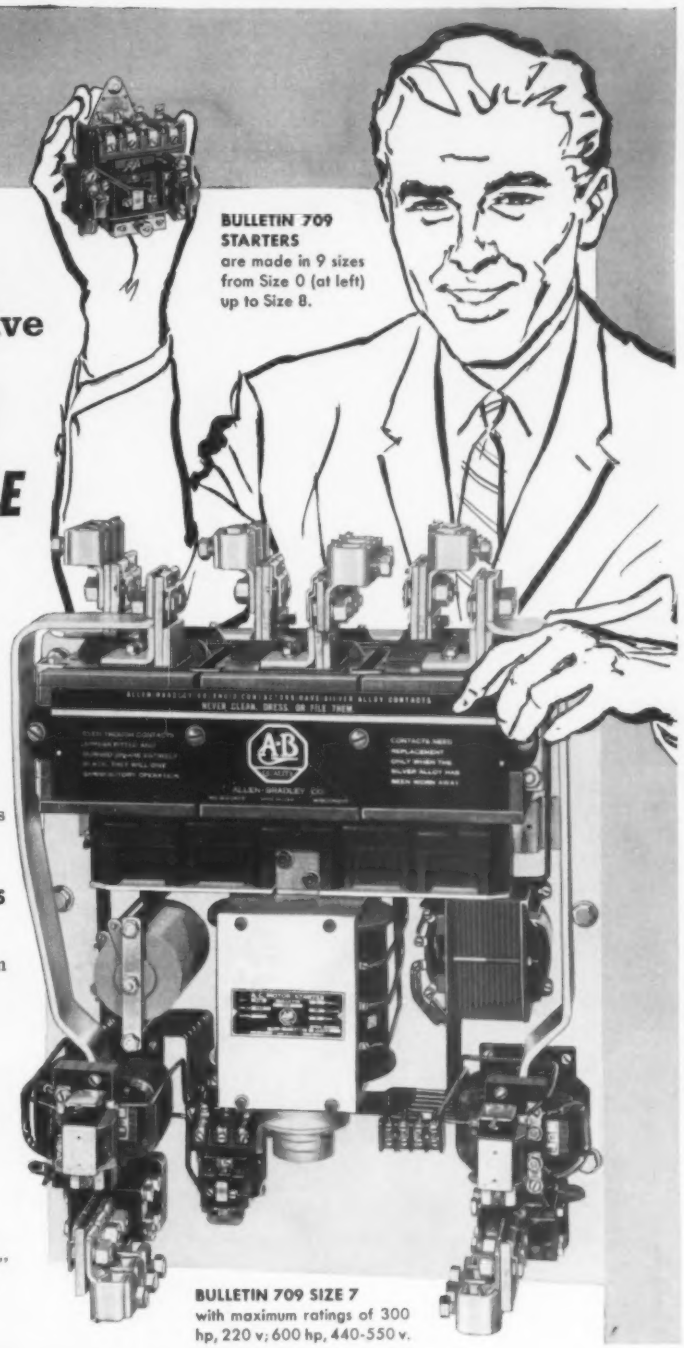

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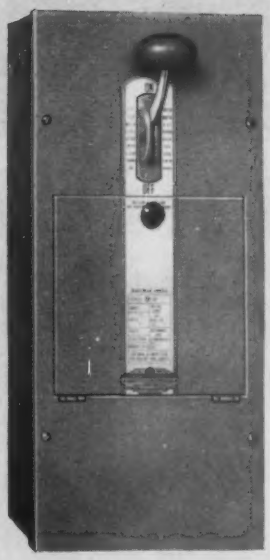

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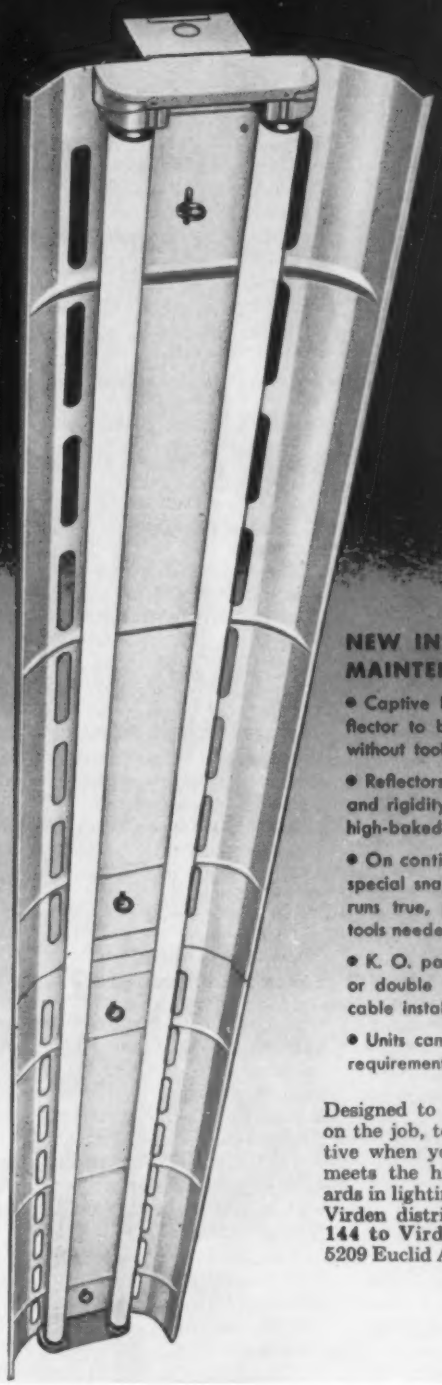

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Washington report

By Jack James

Digest of Washington news of special interest to the electrical industry

Employment rises in eight southern states

IN EIGHT southern states construction contractors employed 30,900 more workers this March than they did in March 1958.

The U. S. Department of Labor reports that March this year contractors employed 426,800 men; last year they employed 395,900 men.

The eight states are: Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia.

* * *

How new labor bill would affect employers

WITH A RESOUNDING 90 to 1 vote the U. S. Senate passed the Kennedy Labor Bill and sent it on to the House of Representatives. Final passage seems assured.

The bill is aimed at union reform. Tucked away in the bill, however, are sections that will affect employers in the electrical industry.

If you use the National Labor Relations Board and are an official of your firm, you will have to file an affidavit that you are not a Communist (as union officers do).

If you hire a labor relations consultant to present your point of view about unionization to your employees, you will have to report to the Department of Labor in detail, or if your firm spends more than $2,500 a year for this purpose, you will have to report.

You will have to report any payment, loans, direct or indirect, or money you give a union officer or employees, except wages.

You will have to keep records to verify these reports.

You will be forbidden to lend money to union officers whose union is seeking to represent your employees.

For violations you can be fined as much as $10,000 and sent to jail for a year. The same penalties apply for destroying records.

You will be able to file an unfair labor practices charge against a union that pickets for extortion and thus get a speedy injunction against picketing.

Electrical building contractors will be able to negotiate pre-hire contracts and contracts that require union membership after seven days on the job, except in states with Right-to-Work laws.

* * *

April construction sets new record

CONTRACTORS across the U. S. A. put up $4.2 billion worth of new construction in April to set a new record for the month. Construction rose 10.7 per cent over March, and 15 per cent over April 1958. During the first four months of 1959, contractors erected $15.1 billion worth of new construction, 13 per cent above the corresponding period in 1958.

The figures are estimates made jointly by the U. S. Departments of Commerce and Labor.

* * *

"Hot stick" threat cause for discharge

A THREAT by the chief union organizer at an electrical utility firm to drop a "hot stick" on his foreman is grounds to discharge him, a National Labor Relations Board trial examiner declares.

The Electrical Workers Union (IBEW), claiming union discrimination, had appealed to the Labor Board.

The incident occurred at the Tallapoosa River Electric Cooperative, Lafayette, Ala., and involved an electrician and a line foreman.

According to trial examiner James T. Rasbury here is what happened:

The electrician, a seven and one half year employee, drew up a petition which fellow workers signed. The petition asked the IBEW to represent the employees. An International representative met with the employees, and during a course of three or four meetings, the employees signed union authorization cards. The Labor Board then held a representation hearing.

Following the hearing according to the electrician's own testimony, he joined several other employees in a conversation about the union. In speaking about the foreman, the electrician said: "He said something about . . . I don't remember his exact statement . . . He said something about he didn't know whether he would join the union, or not. If he didn't join, there wasn't anything we could do about it. And I said, 'Well, if I go out with you, I'll drop a hot stick upon your head.' . . . and he replied, 'Well, I'll do the same thing to you' and 'I can use my fists'."

Nothing else happened. The group dispersed.

(Board examiner Rasbury states that a hot stick is a wooden instrument about 8 feet long, weighing 8 to 10 pounds, which has two metal bands and a metal hook at one end. It is used to open and close switches in electrical lines.)

Two days later the line superintendent noticed a certain tension among employees and a tendency to gather in small groups and talk. He talked to the foreman, who told him about the hot stick threat. The foreman said: "You know how everything is. I figured I could take care of it myself unless you came to me. I didn't want to come to you to fire the electrician, but I've got to watch him."

The next day the firm discharged the electrician who made the hot stick threat.

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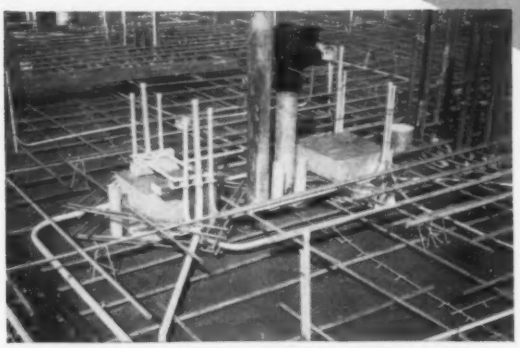
General Contractor: Sumner Sollitt Company
Electrical Contractor: Sievert Electric Company



Compact stub groupings, good alignment, are marks of craftsmanship. Perfectly round ELECTRUNITE stays round, even when knocked over and carefully straightened, is the report on the job. Another reason why . . . *the best costs less installed.*

Uniform concentricity of ELECTRUNITE assures snug fit of couplings and connectors—shutting out moisture and concrete. No threads to cut, no runs to turn. Proof can be found in the millions of feet of ELECTRUNITE that has been installed in concrete. Installations made more than 25 years ago are still in service.

80,000 feet of Republic ELECTRUNITE® E.M.T. was used in the construction of Prairie Shores Apartments, Building #2, Chicago, Illinois. And more has been ordered for the third building of this group. Because . . . *The Best Costs Less Installed!*

In bending, pouring, wire-pulling, pushing, ELECTRUNITE E.M.T. meets every on-the-job installation test. ELECTRUNITE is lightweight, easy to handle. Yet, provides all the corrosion-resistance protection, strength, and advantages of steel.

ELECTRUNITE E.M.T. is "INCH-MARKED"® in feet and inches for easy, accurate measuring. Full length "GUIDELINE"® keeps bends in the correct plane, avoids costly "wows". Exclusive "INSIDE-KNURLING" with new SILVERSLICK Finish makes wire pulling up to 37% easier, wire pushing easier, too.

ELECTRUNITE E.M.T. is produced to meet all electrical codes, specifications, and carries the UL Seal of Inspection. To learn more about Republic ELECTRUNITE E.M.T., call your local electrical distributor, or write. Send coupon.

REPUBLIC STEEL
STEEL AND TUBES DIVISION

REPUBLIC STEEL

Cleveland 8, Ohio

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
DEPT. C-7673-A
227 EAST 131st STREET • CLEVELAND 8, OHIO

I would like to learn more about the installation advantages and economies of Republic ELECTRUNITE E.M.T. Please send information.

Name_____ Title_____

Firm_____

Address_____

City_____ Zone_____ State_____

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

LIGHTING PANELBOARDS — A 4-page descriptive folder featuring a line of plug fuse and toggle switch panelboards for lighting control circuits is now available from Frank Adam Electric Co., 3650 Windsor Pl., St. Louis, Mo. The folder includes box sizes, details of construction, wiring gutters, special features, and catalog numbers.

Write in No. C100 on card, Pg. 19

CIRCUIT PROTECTION — A 24-page illustrated handbook contains suggestions for selecting the right kind of protection for electric circuits, motors, appliances and apparatus. Includes motor wiring diagrams and a complete list showing proper size fuses to use. Available from Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo.

Write in No. C102 on card, Pg. 19

ELECTRIC HEATERS — A new catalog describing their line of electric heaters is available from Hunter Division of Robbins & Myers, Inc., Memphis 14, Tenn. The bulletin, Form No. EH-112, contains the design features and specifications of R&M-Hunter automatic baseboard, convection baseboard, wall, portable, and bathroom heaters.

Write in No. C103 on card, Pg. 19

MODULAR LIGHTING—A twelve-page folder describing and illustrating their line of surfaced and recessed fluorescent modular fixtures is announced by Moe Light of Thomas Industries Inc., Lighting Division, 410 S. Third St., Louisville, Ky. Complete coefficient of utilization and candlepower distribution tables are included for each set of fixtures.

Write in No. C104 on card, Pg. 19

MANHOLE HEATER—A four-page brochure issued by Morrison-Pelsue Co., 2256 S. Delaware S., Denver 23, Col., describes and illustrates applications of the MoPeCo Ventilating Heater available in several models, electrical or gasoline engine powered.

Write in No. C105 on card, Pg. 19

LIGHTING FIXTURES—A four-section, 72-page catalog printed in full color is now available from EJS Lighting Corp., 921 E. Pico Blvd., Los Angeles 21, Calif. The four sections include hundreds of designs classified as residential, architectural, special, bullets and portables.

Write in No. C106 on card, Pg. 19

HYDRAULIC POWER TOOLS—A new bulletin describing their two-speed, fast-approach portable power unit for hydraulic tools such as conduit benders, cable pullers, and pipe pushers is announced by Greenlee Tool Co., Rockford, Ill.

Write in No. C108 on on card, Pg. 19

CONDUIT WIREHOLDERS — A new information sheet describing their line of all-purpose conduit wireholders is now available from Knox Procelain Corp., P. O. Box 2031, Knoxville, Tenn. The illustrated sheet gives installation information, design features, and specifications.

Write in No. C109 on card, Pg. 19

LAMP GUIDES—Sylvania Lighting Products, 60 Boston St., Salem, Mass., has made available three lamp guides containing general information, technical data, and catalog listings on their lines of fluorescent lamps, incandescent lamps, and mercury lamps.

Write in No. C110 on card, Pg. 19

PLUGS, RECEPTACLES — Two basic designs — explosion-proof and weatherproof—of Killark plugs and receptacles are fully covered in a new catalog section. This line offers many advantageous features, and is available in many styles and sizes to fit various boxes. Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis 13, Mo.

Write in No. C111 on card, Pg. 19

ELECTRICAL DEVICES — Two publications, the pocket Federalog 111-PR and Bulletin 3-230, have been made available by Federal Pacific Electric Co., 50 Paris St., Newark, N. J. Complete details concerning circuit breakers, panelboards, fusible service equipment, safety switches, industrial motor control and lighting and power panelboards are contained in the 32-page pocket-sized catalog. The 8-page bulletin is devoted to the company's new line of QMQB fusible switches and panelboards.

Write in No. C112 on card, Pg. 19

BUILT-IN HEATERS—Thermador Electrical Manufacturing Co., 5119 District Blvd., Los Angeles 22, Calif., has announced the availability of three new catalog sheets on their line of built-in electric heaters. The heaters described are their portable radiant-fan heater, electric ceiling heater, and baseboard electric heater.

Write in No. C113 on card, Pg. 19

PRICE SERVICE—Specimen copies of the National Price Service price books are available on request from Henderson-Hazel Corp., 13601 Euclid Ave., Cleveland 12, Ohio. Please indicate whether you are a contractor or wholesaler. Each specimen includes a complete index, a representative sampling of completely illustrated price sheets, and information of special interest to those concerned with pricing electrical construction materials.

Write in No. C114 on card, Pg. 19

FLUORESCENT FIXTURES—The new Miller Sabre fluorescent fixture is illustrated in the Sabre catalog, page 13, published by The Miller Company, Meriden, Conn. This page points out application, construction details, and dimensional, illumination, and installation data.

Write in No. C115 on card, Pg. 19

CABLE SUPPORTING TRAYS—The Globe Co., 4000 South Princeton Ave., Chicago 9, Ill., has made available a new catalog on their line of cable supporting tray systems and accessories. The catalog contains information on design features, specifications, and installation.

Write in No. C116 on card, Pg. 19

CENTRIFUGAL ROOF VENTILATORS—An 8-page, two-color folder (SDA-220) gives construction features, performance data, dimensions and recommended specifications for the new Centrifugal Roof Ventilator manufactured by The Peerless Electric Company, Warren, Ohio. Other important Peerless Fan and Blower products and a list of Peerless sales representatives are also included.

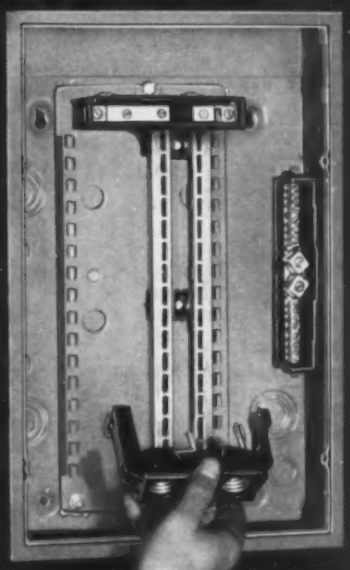
Write in No. C117 on card, Pg. 19

CONDUIT FITTINGS—Bridgeport Fittings, Inc., 209 Center St., Bridgeport, Conn., offers a twenty-six page catalog describing their line of conduit, bushings, lock nuts, couplings, nipples, supports, connectors, and other fittings. Size, weight, and packing details are included.

Write in No. C119 on card, Pg. 19

Uncompromised flexibility begins with an empty box

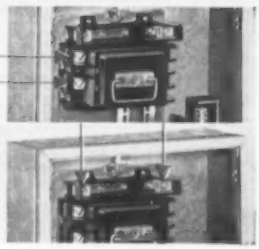
...and a "Stab-in" idea



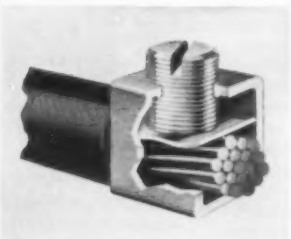
FEDERAL PACIFIC'S NEW TYPE SF FUSIBLE LOAD CENTER LINE—has no fixed circuits ... 10 standard enclosures take the place of 208 separate devices ... meet all requirements from 30 through 200 amp main disconnects.

FLEXIBILITY THROUGH STANDARD STAB-IN UNITS
—all 5 are designed on a 1½" module, can be stabbed into simplified bus in any combination, in any position.

ADDED FLEXIBILITY THROUGH DUAL-RATING
—all enclosures are U.L. approved for use as either service equipment (A) or as load centers (B).



PLUS THE FLEXIBILITY OF FLUSH/SURFACE FEATURE
—each Type SF enclosure can be either flush or surface mounted.



MORE FLEXIBILITY THROUGH COPPER/ALUMINUM LUGS
—U.L. approved. Lets you take advantage of low-cost aluminum conductors.

Now contractors can meet all day-to-day requirements with a small investment in 10 flexible enclosures, buying stab-in units as needed. Both are readily available from distributors stock. Write for bulletin 1-215A, Federal Pacific Electric Company, General Offices: Dept. 361, Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**
The Best in Electrical Distribution and Control Equipment

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

SPACE HEATING GUIDE—Cavalier Corp., Chattanooga 2, Tenn., has prepared a Guide for Calculations on Electric Space Heating. It is based on a study of several thousand installations of electric heat and is a handy reference for calculating electric heating requirements and estimating operating costs. The booklet contains discussion, charts and floor plan examples.

Write in No. C120 on card, Pg. 19

NEOPRENE RUBBER COATING—Descriptive literature and application data are available from Charleston Rubber Co., Stark Industrial Park, Charleston, S. C., on their new product Charcote, a durable neoprene rubber coating, which gives protection against corrosive fumes, weathering, abrasion, and other hazards.

Write in No. C121 on card, Pg. 19

NON-METALLIC FIXTURES — A new complete condensed catalog with list prices covering their complete line of non-metallic lighting fixtures is now available from Union Insulating Co., P. O. Box 351, Parkersburg, W. Va.

Write in No. C122 on card, Pg. 19

CONNECTOR BULLETINS — Six new bulletins have been released by Ilsco Corp., 4730 Madison Rd., Cincinnati, Ohio. They cover the Ilsco line of solderless connectors, special connectors, lugs, neutral bars, crimp lugs, and the Ilsco Lok-A-Blok. The bulletins include descriptive material, dimensions, and packaging data.

Write in No. C123 on card, Pg. 19

TROFFER CATALOG—A 36-page catalog, with complete information on their newly re-designed architectural troffers has been released by Smithcraft Lighting Division, Chelsea, Mass. Divided into sections for selection of lighting units, the catalog gives complete illustrations and data for 1 and 2 foot troffers in all types of ceiling construction. Also included in the catalog is information on ceiling lighting patterns, shielding designs, lighting techniques and applications.

Write in No. C126 on card, Pg. 19

LIGHTING FIXTURES — Eastern presents their most complete catalog, 32 pages of engineered lighting data, including a variety of fixtures for all architectural, commercial and industrial applications. Eastern Fixture Co., Inc., 170 Vernon St., Boston 20, Mass.

Write in No. C129 on card, Pg. 19

TRENCHER — A catalog sheet on the Pow-R-Spade trencher manufactured by Stampings, Inc., Davenport, Iowa, is now available. The labor-saving machine digs a 3 in. wide trench from 1 in. to 24 in. deep, or 4 in. wide, 18 in. deep.

Write in No. C130 on card, Pg. 19

LIGHTING FIXTURES—Progress Manufacturing Co., Castor Avenue and Tulip Street, Philadelphia 34, Pa., announces the publication of two new lighting catalogs. "Lighting by Progress", a 52-page booklet, describes their line of residential fixtures. "Home Lighting by Minute Mount" is a 12-page bulletin illustrating new ideas in budget lighting.

Write in No. C131 on card, Pg. 19

MOTOR CONTRACTORS—For control of large motors, primary switching of induction furnace transformers, and other high voltage applications, **Allis Chalmers Manufacturing Co.**, Milwaukee 1, Wis., has developed the **high voltage air-break contactors** (type 256A) which are described in a bulletin issued by the company.

Write in No. C132 on card, Pg. 19

ELECTRICAL DUCTS — A brochure is now available from John-Manville, 22 East 40th St., New York 16, N. Y., describing their line of Transite electrical ducts. The two-color, 11-page, illustrated bulletin contains information on composition, methods of manufacture, applications, costs, and installation. Also included are shipping weights and dimensions of Transite conduit and Korduct.

Write in No. C133 on card, Pg. 19

TRANSFORMER MOUNTS—Universal Pole Bracket Corp., P. O. Box 8454, Houston 4, Texas has announced the publication of a catalog describing their line of transformer mounts and capacitor racks. The illustrated bulletin contains catalog information and data on design features, installation, handling, and warehousing.

Write in No. C134 on card, Pg. 19

TRANSFORMERS—R T & E Corp., 1900 E. North St., Waukesha, Wis., has available a bulletin describing Terra-Tran transformers for residential underground distribution. The 15-page booklet is illustrated and contains complete information on construction, application, and design features.

Write in No. C135 on card, Pg. 19

ELECTRICAL FITTINGS—A new catalog has been published by Lew Electric Fittings Co., 627 West Lake St., Chicago 6, Ill. It contains information on their lines of benders, cast junction boxes, fish cable floor boxes, floor nozzles, and Ovalcondu and fittings.

Write in No. C136 on card, Pg. 19

PIPE TOOLS—A new catalog containing dealers' net prices is now available from Nye Tool Co., 4120 Fullerton Ave., Chicago 39, Ill. The bulletin is illustrated and contains information on design features and applications of Nye pipe tools.

Write in No. C137 on card, Pg. 19

RADIANT HEATING — Ceilheat, Inc., 5212 Homberg Dr., Knoxville, Tenn., has announced the availability of a bulletin describing their line of concealed radiant home heating systems. The bulletins includes the principles of radiant heating, installation procedures, and advantages of this heating system.

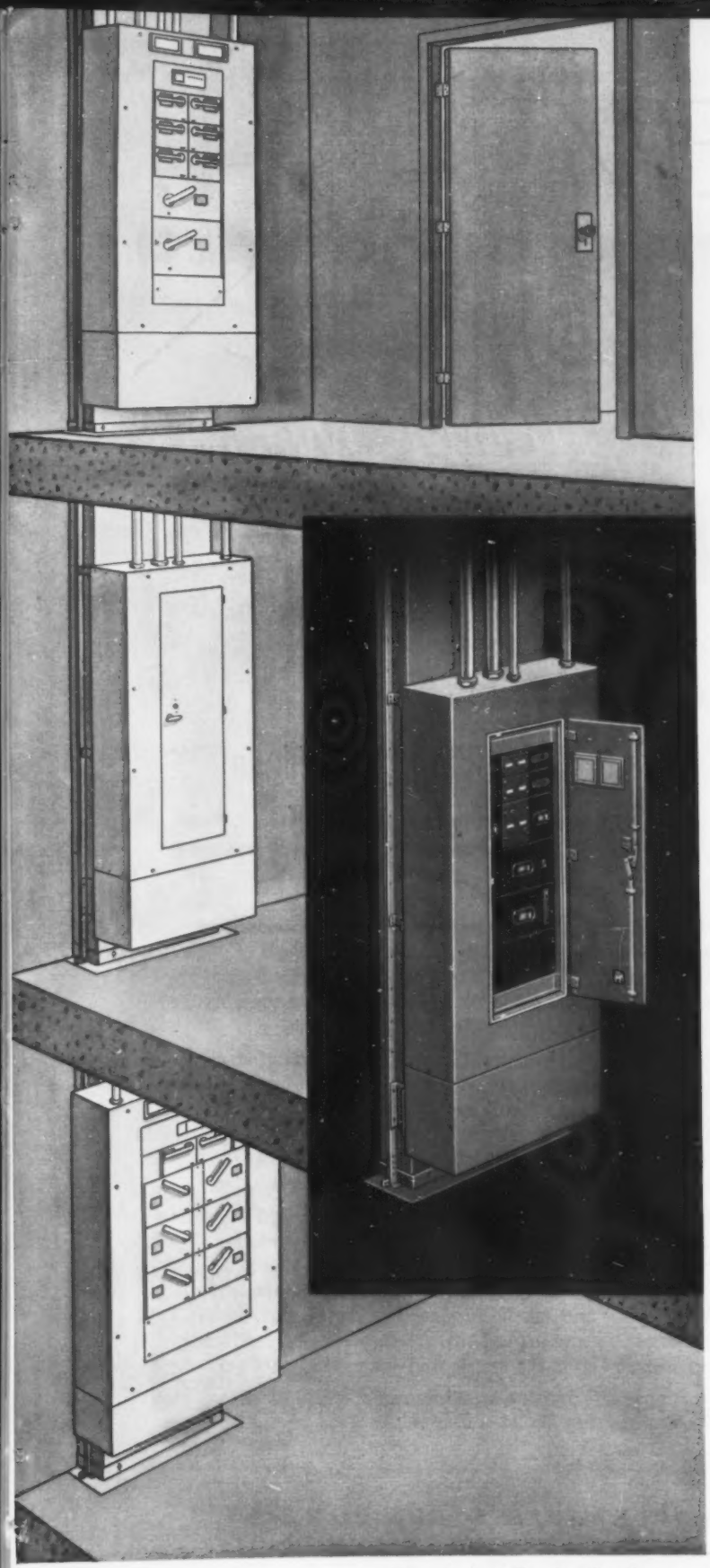
Write in No. C138 on card, Pg. 19

LIGHTING FIXTURES — A 28-page, illustrated booklet from Lavery and Co., Inc., 15479 Starthern St., Van Nuys Calif., describes their line of lighting fixtures for western, ranch, early American, homestead, and ranch modern homes. Specifications and catalog data are included.

Write in No. C139 on card, Pg. 19

EXPLOSION-PROOF EQUIPMENT—"An Electrical Engineer Comes to Crouse-Hinds" is the title of a new 6-page folder by Crouse-Hinds Co., Syracuse 1, N. Y. The bulletin describes design and construction principles involved in manufacturing Crouse-Hinds Condulet electrical equipment for hazardous locations.

Write in No. C140 on card, Pg. 19



Power to

the sky with

RISER DUCT BY BULLDOG

Now, there's a *sure* way to provide ample power as many stories high as needed—BullDog's new combination of high-performance Lo-X® duct and integral-mounted power panels.

It's a system where a low, balanced voltage-drop can be predetermined . . . where power loss is minimized . . . and where each duct section has an extra reserved current capacity inherent in its construction.

Other advantages: Power may be tapped off through the compact panels at *any joint* on the duct. Panels bolt easily to the bus bars . . . are available with I-T-E Molded Case Circuit Breakers through 800 amperes or with BullDog's famous Vacu-Break® Switching Units through 600 amperes. Provisions for current-limiting Amp-traps* are optional to protect against dangerous high short circuit currents. And most panels have space for adding future circuits when the need arises.

Install wisely, install the finest. Install Integral Panel—Lo-X Riser Duct by BullDog.

* Chase-Shawmut registered trademark

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayton Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

Consult the following Southern representatives:

Wilson Electrical Equipment Co.
3210 Garrow St., P.O. Box 1725
Houston, Texas

Wilson Electrical Equipment Co.
101 E. Maple Street
San Antonio, Texas

Standard Electric Mfg. Company
2401 Federal St., P.O. Box 1138
Dallas 1, Texas

Walker Electrical Co., Inc.
125 Bennett St., N.W., P.O. Box 2308, Station D
Atlanta, Georgia

Now...a NEW overhead ground wire

ALUMOWELD™

Aluminum-Covered Steel Wire

Exclusive features—

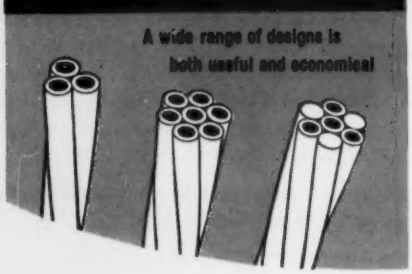
a **thick cladding** of aluminum
a controlled **atomic weld**

Give your transmission lines permanent protection with the new light-weight, low-cost Alumoweld Overhead Ground Wire—the only aluminum-covered steel wire with a thick cladding of aluminum and the only one made by the controlled atomic-weld process.

Not only does Alumoweld have the strength of steel wire, but because of its 25% by area aluminum covering, it offers the added advantages of much higher conductivity and far greater service life. In fact, Alumoweld has corrosion resistance equal to solid aluminum wire, has one third the conductance, and eight times the strength.

In Alumoweld Overhead Ground Wire, you get three important benefits. (1) Its thick aluminum covering permanently protects the high-strength steel core against corrosion. (2) The electrical conductance is excellent for relaying and for discharging lightning and transient currents to ground. And, (3) Alumoweld's high strength permits stringing for ample mid-span clearance.

For more information on Alumoweld, write today for Engineering Bulletin E.D. 1172.

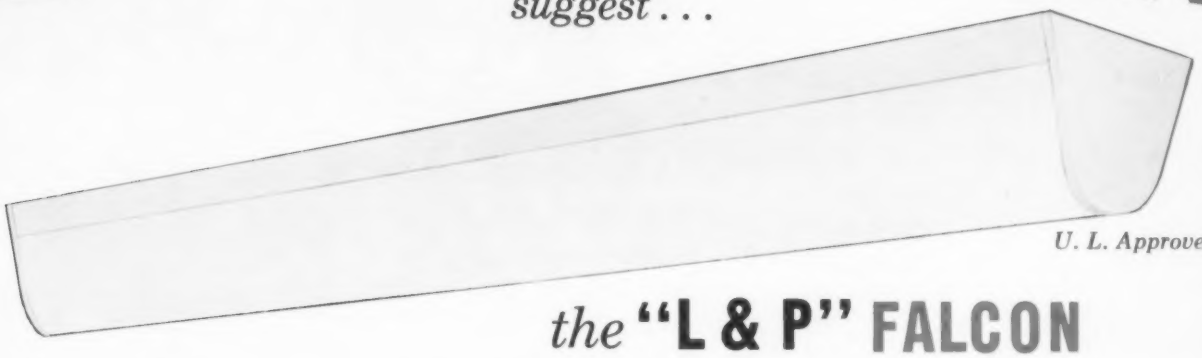


ALUMOWELD

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION Glassport, Pa.
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

LIGHTING A CORRIDOR?

we suggest . . .



U. L. Approved

the "L & P" FALCON

APPLICATION:

These units have been specially designed for lighting corridors of schools, office buildings and institutions, and similar installations.

TYPE:

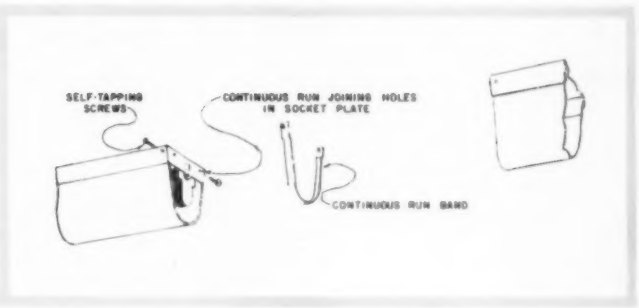
Rapid Start and Slimline. One lamp, tandem two lamp, two lamp or four. Plastic enclosed.

CONSTRUCTION:

Heavy gauge steel construction. Connector straps replace ends at joints on continuous runs. Extruded, plastic enclosure snaps in for easy maintenance.

MOUNTING:

Fixture may be surface or pendant mounted. Designed for continuous row or single unit installation.



ST 124, single stem canopy set, used when joining fixtures on continuous runs. Normally two ST 124 sets are used for each individually mounted 8 ft. unit. Std. stem length 24".

ST 10, double stem canopy set. Used for suspending individual units normally not over 4 ft. long. Std. stem length 24".

Cat. Series HPC

For catalog and price sheets, write or phone today to

LIGHT & POWER UTILITIES CORP.

1035 FIRESTONE BLVD. • MEMPHIS, TENNESSEE

LIGHTING A RESTAURANT?

. . . we suggest the **L & P**

DELTA SKIRTED DOWNLITE

Cat. No. 440 and 445

All the quality, tested performance and economy that have earned Light & Power an enviable reputation in fluorescent fixtures are also available in the complete L & P Delta line of incandescent fixtures.

For your next restaurant installation check these features of the Delta Skirted Downlite before you select your incandescant fixtures!

TYPE:

Skirted Downlite.

CONSTRUCTION:

Heavy duty aluminum housing and perforated aluminum skirt. Complete with plaster ring. Designed to give plentiful glare-controlled light.

ELECTRICAL:

660W - 250V Heavy duty porcelain socket. Wired with 4½ foot No. 14 gauge A.F. leads. AFL-IBEW fabricated. UL approved. Wired for 110V - 60 cycle.

FINISH:

Perforated skirt brushed satin aluminum or satin brass. All parts sprayed with heat resisting lacquer and baked to 375° to assure permanent finish.

For catalog and price sheets, write or phone today to

DELTA delta incandescent division

LIGHT & POWER UTILITIES CORP.

1035 FIRESTONE BLVD. • MEMPHIS, TENN.

Distributed by Wholesale Dealers Only

There's an

L&P

Representative Near YOU!

For further information and prices on L & P fluorescent fixtures—standard or "custom-made"—check the following list, and phone or write the L & P representative nearest you:

N. B. Nichols
2509 Bishop
Little Rock, Arkansas

Craig-Owen
306 E. 11th St.
Chattanooga, Tenn.

C. V. Hammon
845 Southwest 52nd St.
Oklahoma City, Oklahoma

Irving Milow
415 Clover St.
Rochester, New York

W. J. Milner
3627 Peachtree Rd., N. E.
Atlanta, Georgia

J. Louis Weyhing
1914 Rutherford Ave.
Louisville, Kentucky

Irvin Spero
4142 Stillmore Rd.
South Euclid, Ohio

Howard E. Johnson
2976 Randy Lane
Dallas, Texas

Arthur H. Swartz
5003 Kelso St.
Houston, Texas

J. F. Hisserich
2001 Big Bend Ave.
St. Louis, Missouri

Joe E. Pearce & Associates
3845 N. Irvington St.
Indianapolis, Indiana

Associated Manufacturers Agents
900 Carondelet St.
New Orleans, Louisiana

Bill Sylvester
2144 Welton St.
Denver, Colorado

Newell L. Willard
3625 Ivy
Denver, Colorado

J. A. Goode Company
15842 James Couzens Ave.
Detroit 38, Michigan

Gerald Preacher
1225 Pickens
Columbia, South Carolina

Light & Power Utilities Corp.
1035 Firestone Blvd.
Memphis, Tennessee

INFORMATION CENTER

BOOKLETS • NEW PRODUCTS • ADVERTISEMENTS

Help yourself to free literature and more details on any product mentioned in this issue.

Instead of writing a dozen different manufacturers for free literature and more information on products, tools, or services, just insert on the cards below the appropriate key numbers of the items in which you are interested. These cards may be used to get information on products mentioned in the following departments (see Contents Page for page number):

Catalogs and Bulletins — New Electrical Products
New Utility Equipment — Manufacturers' Literature

Be sure to print or write legibly your name and address—drop it in the nearest mail box and

ES pays the postage!

JUNE, 1959

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

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Send this FREE LITERATURE (fill in key numbers):

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Send free information on these ADVERTISEMENTS:

Company_____ Page_____ Company_____ Page_____
Company_____ Page_____ Company_____ Page_____

My Name _____ Position_____
My Company's Name _____
Address (number and street) _____
City _____ Zone_____ State_____

JUNE, 1959

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

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_____ _____ _____ _____ _____ _____

Send this FREE LITERATURE (fill in key numbers):

_____ _____ _____ _____ _____ _____
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Send free information on these ADVERTISEMENTS:

Company_____ Page_____ Company_____ Page_____
Company_____ Page_____ Company_____ Page_____

My Name _____ Position_____
My Company's Name _____
Address (number and street) _____
City _____ Zone_____ State_____

These cards can help you get valuable information

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

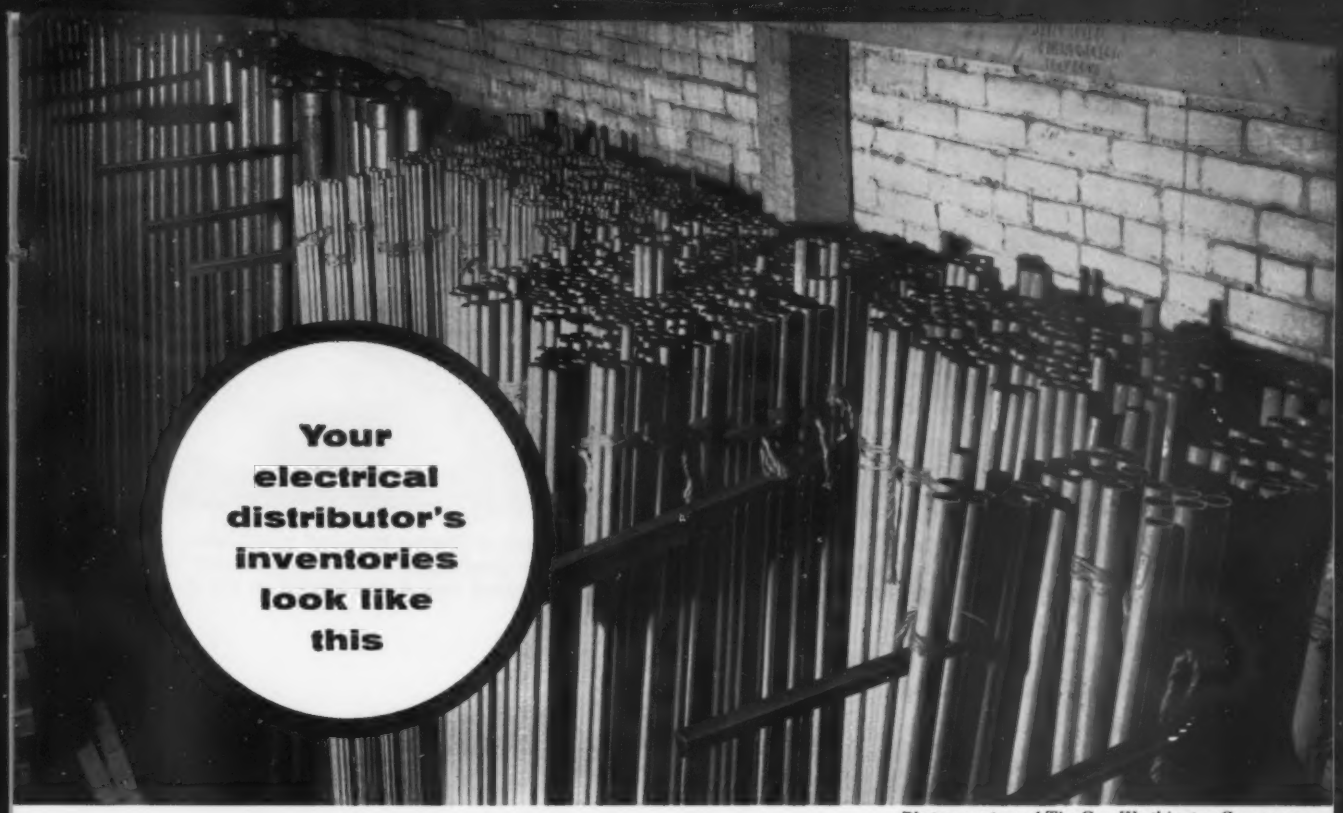
Electrical South
806 PEACHTREE ST., N. E.
ATLANTA 8, GEORGIA

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South
806 PEACHTREE ST., N. E.
ATLANTA 8, GEORGIA



Photos courtesy of The Geo. Worthington Company

To cut inventory costs, make Youngstown's Electrical Distributor your local source for all rigid steel Conduit and E.M.T. requirements. Make full use of his complete local stocks, fast delivery service. His one-source service simplifies your purchasing and bookkeeping, too. You'll find him an efficient, time-saving, partner-in-production.

THE
YOUNGSTOWN
SHEET AND TUBE COMPANY
Youngstown, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel

When Atlas Concrete of Ocala, Fla., built its new plant, Glenn Electric Co., Leesburg, Fla., landed a lucrative wiring job for the electric installation.

Cone Brothers of Tampa installed pushbutton control to boost the production of block to 40,000 a day, making the plant one of the largest in the South.

Concrete industry converts

By Harry J. Miller

This article should be especially helpful to the following readers:

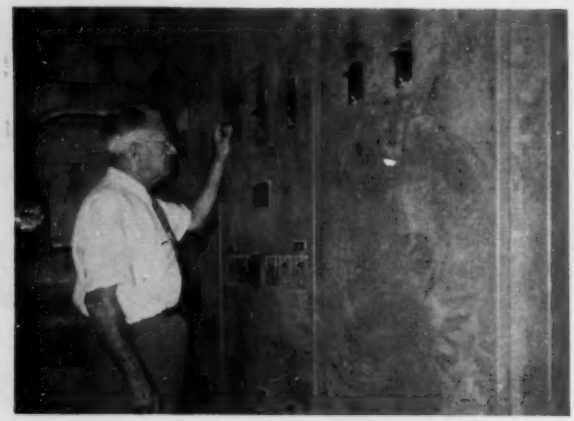
- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers ✓
- Consulting Engineers ✓

◆ ELECTRICAL contractors who are keeping abreast of developments in the concrete ready-mix industry, are finding a lucrative field in the rapidly expanding use of electronic control by concrete-makers anxious to improve both the quality and quantity of their products.

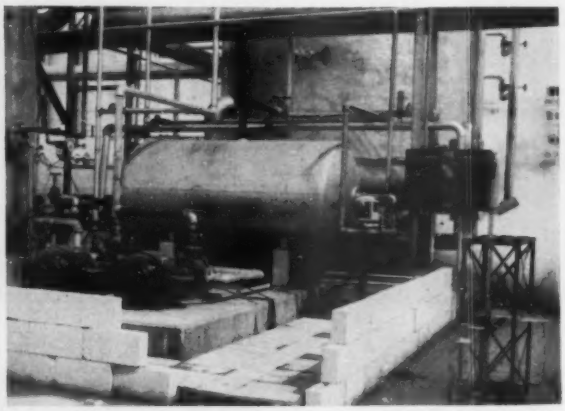
Aside from complete and expensive modernization which involves astronomic finances, a number of plants are installing less comprehensive electrical control. In both cases, electrical contractors versed in electronics are finding a lush market in this fast-developing field. Such jobs run into real money and provide construction as well as maintenance work.

For example, when Cone Brothers, road, bridge, and sewer-builders of Tampa, installed push-button control to boost the production of concrete block to 40,000 a day, making the plant one of the largest in the South, the electrical firm of Meadows and Robinson, of Tampa, got $35,000 for the wiring. The remote-control panel alone cost $18,000.

When Atlas Concrete of Ocala built its new plant, Glenn Electric Company, of Leesburg, Fla., landed a lucrative wiring job on the

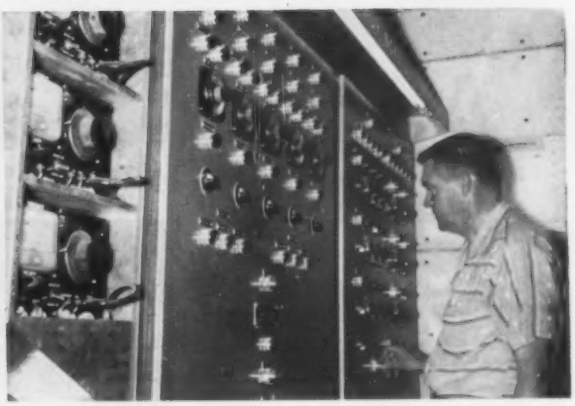


Dead front panels carry the industrial load center for the Cone plant. The entire wiring job was $35,000. The remote-control panel alone cost $18,000.



Considerable wiring and motors and controls are involved in the change-over to electronic operation. This is a part of the new plant in Tampa.

Because a nerve center such as this cuts costs, speeds production, controls quality, the electrical contractor has three good selling points for the job.



Engineer Dave Linton at the controls of the panel at the Cone Brothers plant. This wiring installation makes plant control a one-man operation.

to electronic control

company's electronic control installation.

Throughout the concrete industry, there is evidence of a desire to install electrical networks designed to do automatic batching and eliminate the factors that prevent the production of concrete products of constant quality. Electronic control is the ideal method of achieving uniformity, and these installations offer an opportunity to electrical contractors whose organizations include men skilled in this particular type of work.

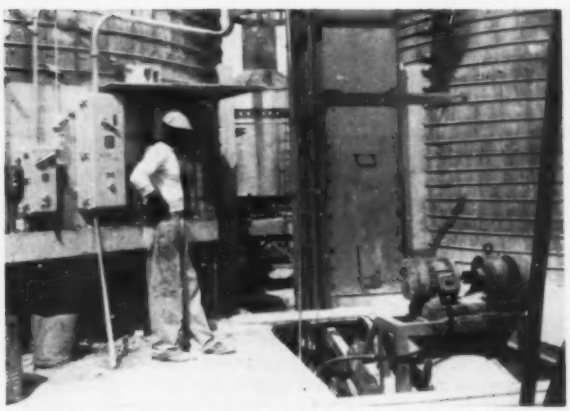
One-man operation is the advantage sought by the concretemakers, with the plant so arranged mechanically and electrically that a single individual in the office has control over all functions.

For example, consider the Atlas plant. The long conveyor fills a cement silo with a capacity of 850 barrels, and the bin is arranged for four aggregates and two cements. Also included in their operation is an elevator, capacity 50 tons an hour, which is electric-motor driven off the control panel.

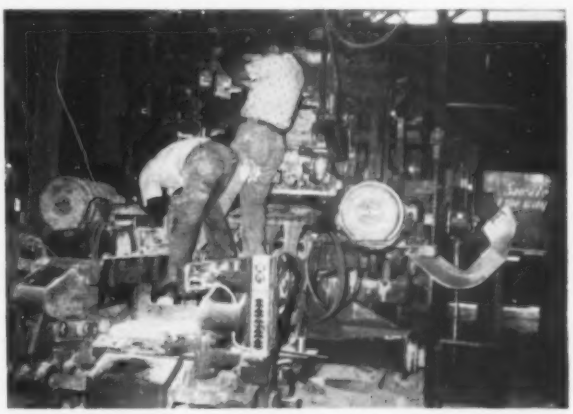
The conveyor that fills the silos and the bin distributes the material by means of a tripper that triggers an electrical action, and the reclaiming conveyor under the silos is filled by the use of electric solenoid operated air gates, remotely controlled from the office.

Electronic control extends to the use of an automatic beam scale. The operator can set up the desired batch required, push a button, and the cement and aggregates of sand and rock are automatically batched to such highly accurate tolerances as to make

(Continued on page 133)



Part of the wiring installation made by Meadows and Robinson of Tampa at the Cone plant shows motor and controls operating the unloading conveyor.



In addition to installation work, there is an open field for contractors in electrical maintenance work on the concrete block-making machines.

A contractor examines shortcuts

By Harry J. Miller

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities
Electrical Wholesalers
Electrical Inspectors
Industrial Engineers
Consulting Engineers

Godfrey S. Grant, (left) owner of West Coast Electric and Walter Grieve, estimator, often work until midnight getting estimates out.

◆ "IF TODAY'S contractor is to survive in the face of competition—sometimes of the zany sort—that is forever snapping at his heels, he needs to focus with deeper concentration on the bugaboo of overhead.

"Item by item, he should subject every one to a microscopic examination to discover how it can be lessened or even eliminated entirely.

"We figure that overhead is a measure of our ability to give service without penalizing our customer. To that end, we adopt a critical, logical attitude to discover what corners can be cut legitimately to lessen costs without impairing efficiency. Oddly enough, such economies often lead to greater efficiency, which means we attain a better competitive position!"

So says St. Petersburg contractor, Godfrey S. Grant, whose West Coast Electric Company annually chalks up $500,000 in wiring contracts in the Florida city.

Overhead classifications

Contractors are well informed of the fact that items of overhead are generally classified as either fixed or variable. Fixed items such as rent, interest, depreciation, etc., are those that remain the same regardless of changes in the amount of wiring done.

But while the variable overhead charges tend to increase with increased business and vice versa, examples being telephone expense, payroll taxes, truck fleet maintenance, bad debts, etc., Grant says that "it ain't necessarily so."

He feels that the contractor needs to overhaul this conventional concept of the variable factors in overhead by asking himself some pertinent questions like: "Am I handling this item of overhead because it's the traditional way or am I convinced it's really the most efficient way?

"Have I ever looked on this item as if I were an outsider, thus injecting a fresh outlook?

"Am I handling this item in the way I do just because my competition looks at it that way?"

"The important thing to remember is to try to reduce every item of overhead to its irreducible minimum," says this veteran contractor. For Grant, this involves two things, internal comparison where the ratio or percentage of a given item of overhead to sales volume for one representative period, is compared with the same ratio for another representative length of time. Such information may be obtained from the contractor's profit and loss statements, and these should cover at least a 6-month period.

For instance, if it is found that insurance for period A amounted to 2 per cent of net sales, and that for period B it rose to 6 per cent, it would suggest that closer scrutiny is needed.

External comparisons

There needs also to be an external comparison where the contractor's items of overhead are compared percentage-wise with figures for the industry as a whole and interpreted for the area in which the contractor operates.

"For example," says Grant, "our figures show that it is often expedient for us to withdraw from competing against non-union shops on housing projects.

"When union shops bid against union shops, there is an obvious equalization of prices. But when we enter the lists against a non-union contractor with his lower labor costs, we find ourselves at such a disadvantage as to cause us in some cases to bow out, and relinquish $50,000 and $60,000 jobs. This is due to the labor cost differential.

that help to reduce overhead

Stockman Clifford A. Tharp assembles materials from the estimating sheet and checks outgoing supplies.

Materials are quickly delivered to job sites by the company's stockman in this pick-up truck.

"For instance, on a group of dwellings whose wiring runs $300, we figure paying out 25 hours of $3.25 union scale to complete a house. The non-union operator who pays his help $2.50 an hour, has the edge over us to the tune of $18.75. In many cases, that's his profit on the job.

"While such a profit on 100 houses 'ain't hay,' we refrain from boosting our overhead by going after such jobs. Still, we bid about every job that comes along.

Deciding when to bid

"There's the human element of pride involved in not passing up a chance to bid and in keeping our name alive in bidding circles. To keep down overhead expense in estimating on these jobs, we simply insist that our two estimators and the entire office force work until midnight whenever necessary."

Bolstering his contention that overhead need not rise in direct ratio to the volume of business done, Grant often burns the midnight oil in cooperation with everybody from himself on down to the stockman.

"Take that stockman," says Grant, "he doesn't go out to work a job. His duties are solely to take care of incoming and outging materials. He assembles job supplies from our estimating sheets, and he makes a tour of the jobs to see what's in short supply.

"He's got a pick-up truck to get those needed supplies out in a hurry. Thus we avoid expensive trips to the shop by a $3.25 an hour man to pick up some needed item. We reverse the process by sending supplies out to him via a $2-an-hour stockman.

"Why add to overhead by letting a journeyman browse around the shop for material when the lesser-paid stockman can do it and do a quicker and better job of it, at the same time preventing his stock from being disarranged. Again, the average journeyman in a hurry to get back on the job, may not report the items he takes, and they won't get paid for."

In the field of estimating, Grant has made a sizable dent in overhead cost. "Conventional practice," he says, "is to review the plan and order the material if and when, the shop lands the job. We've abandoned this method as too time-wasting.

"It entails double work for the estimator since he had already compiled the materials once in preparing the bid. When the job is won, this means backtracking to order the materials since many of the original figures were based on installation cost.

"For instance, suppose you're taking an oil burner off the plan. Commonly, the bid figure on wiring it is a lump price based on the contractor's previous knowledge of what such jobs cost, as say $60 of material to wire it. But when you land the job, you just can't hand that $60 figure over to the stockman because he isn't a journeyman, so he's not expected to know all the items the electrician will require for the job.

(Continued on page 130)

Joint NECA-IBEW Southwestern

Paul M. Geary, executive vice president, addresses convention with subject, "Progress Report on National Affairs and Problems." His report included the infiltration of the do-it-yourself idea into big industry and how this trend affected industry expansion in 1958.

Three chairmen of business sessions gather around the auditorium podium. Left to right: G. C. White, vice president District 5, NECA, Empire Electric Co., Fort Worth; William F. Miller, Baytown, Texas; Gilbert F. Sweeney, business manager, Local No. 60, San Antonio.

By Baron Creager

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers ✓

◆ PROBLEMS in electrical construction encountered by teams of NECA contractors and IBEW locals are still numerous, some of them hoary with accumulated age, according to speakers who faced the eighteenth annual joint meeting held in San Antonio, Texas, recently.

Among significant comment by some of the principal speakers were:

There is no justification for criticism of union labor for individual contributions to a political action fund.

The do-it-yourself trend has invaded big industry to the point that it contributed to a decline in electrical construction work in 1958.

Good management-labor relations will not thrive if planted and left to grow unattended.

The Sherman Anti-trust Law is here to stay, will be vigorously enforced, and should be treated with respect by NECA and IBEW.

Distributors are getting tighter and tighter about contractor credit.

Contractors and journeymen who cannot supply good tools and good workmanship should not participate in line construction.

Only meeting of its kind

This joint meeting annually brings together at some point in the Southwest, members of the National Electrical Contractors Association of District 5 and members of the International Brotherhood of Electrical Workers of District 7.

It is the only management-labor meeting of its kind in the world, one in which employer and employees mingle for discussion of mutual business problems.

Convention held in San Antonio

This year's San Antonio meeting drew about the average attendance, with registrations of 365. And the San Antonio weather—cool, cloudy, and rainy by contrast with expected brilliant sunshine—drew facetious comment in abundance, public and private.

Most inspired address of the three, half-day business sessions was by A. E. (Art) Edwards, international vice-president of District 7, IBEW, Fort Worth, who said he could see at work in Texas one of the most vicious of anti-labor movements.

Edwards carefully traced the history of legislation affecting union labor, from adoption of the Sherman Act nationally, down into a period of five years in Texas when, he said, 14 laws restraining labor were enacted during the administration of Gov. W. Lee O'Daniel. He advanced his review into the 1950's, saying the propaganda current in Texas is designed to make it impossible for unions to operate.

Referring to union labor's Committee on Political Education, COPE, Edwards said contributions to that effort were all voluntary, "but the newspapers would have you believe that money came from union funds. I am sure there is no local union business manager who would risk a jail term by putting union funds into COPE."

Quoting lists of big corporations and their total contributions to political funds by category, he said:

"This is no time to criticize labor for its voluntary contributions.

"Meanwhile, sponsors are redoubling their efforts to replace on the statute books, the right-to-work laws defeated in the last elections. And in many legislatures throughout the country, anti-labor legislation is being considered. Some call it pro-management legislation. I call it anti-labor.

"IBEW's skirts are clean, but that doesn't stop the proponents of anti-labor laws."

Trade jurisdictions

Ahead of Edwards on the program was the only IBEW International officer in attendance, Frank

Panel on marketing program. Moderator K. U. Benjamin at podium and, left to right: Session Chairman William F. Miller; Hunter Cunningham, Westinghouse; John F. Biggi, National Wiring Bureau; Joseph Felber, NECA staff; and Lawrence Martin, Dallas chapter manager.

Panel on state licensing laws. Jack Ketzscher, Arkansas, at podium, and left to right: Session Chairman William F. Miller; Panelists Ernest E. Cannon of Arizona; Jack W. Slaughter of Kansas; B. N. Voss of Oklahoma; H. M. Bradley of Texas; and John Yearout of New Mexico.

Graham, assistant to the international president, who discussed "trade jurisdictions."

Graham devoted himself to a detailed review of IBEW disputes and their bases in a number of fields.

"We don't recognize any other craft (except IBEW) on open-country line work," he specified.

Paul M. Geary, who spoke following Edwards, was the one who reported infiltration of the do-it-yourself idea into big industry. He was discussing the fact of less work and less industry expansion in 1958 compared with 1957 and said the do-it-yourself trend in industry partially explained that circumstance.

Geary, executive vice president of NECA, referred to recent articles in a magazine (*Architectural Forum*) that were highly critical of the NECA-IBEW relationship, and Associated General Contractors.

"This is inspired by certain home builders," he said, "and the whole thing is propaganda designed to influence Congress against continuing the prevailing wage law.

Principal objectives

"One of our principal objectives is to maintain and increase the volume of profitable business available to the electrical contractor and eliminate as many abuses as possible. We also seek to create an atmosphere of cooperation between NECA and IBEW at the local level so that we may realize the utmost from our business opportunities. But, our chapters, in cooperation with the brotherhood, must find out where business is and what to do to get it."

In the matter of wages, Geary said he expected the electrical construction industry to follow other construction industries.

He reported there was a total of 12,675 IBEW contractors in 1958, that NECA has 4,150 members (compared with 900 in the 40's) in 122 chapters from which are expected 1959 income of $1,137,000. He said there are 35 different needs of members and five principal services. These, and expected costs for '59 are:

Public relations service, $73,000; marketing service, $173,600; technical and training service, $134,750; labor relations, $98,250; field service, one provided only by NECA among all national trade associations, $363,500.

Earlier on the same program, John S. Clark, introduced as the perennial president of the Southwestern Line Constructors Chapter, addressed the meeting on "Line Constructors Problems and Need for Southwestern Line Constructors Chapter."

Associated with the firm of Reynolds Electrical and Engineering Co., Santa Fe, N. M., he said that in all his dealings with electric utilities, he had found them all to be very fine people, even though with some fixed ideas about line construction.

"However," he continued, "we have not geared our services to the needs of the utilities and until we do that, we have no complaint against the utilities."

He said there is much talk about profit of 6 and 7 per cent, but that actually, profit in this field seldom, if ever, exceeds 2 per cent. One of the big problems in the line construction field, he pointed out, is the training of apprentices. Commenting that someone will build the lines, he added:

"There are several things this chapter is not. It is not an attempt to interfere with or segregate outside jurisdiction. It is not for the purpose of making it possible for any group of contractors to take over. It is a vehicle for people who are doing or will be doing line construction.

"The policy of the chapter is this: Whatever your status, we invite your participation. There is a tremendous amount of this business over this country and you may be interested in doing it. But if you are not prepared with capital, if you are not prepared to supply good tools and good work, there is no point in your participating."

Training line apprentices

Clark was followed by Doug Ellis, new staff member, joint apprenticeship and training committee, Washington, with the subject, "NECA-IBEW Plan for Training of Line Apprentices." He reported on much of his experience in Oregon, discussed generally the requirements of such a program, and said it is "too late to accomplish anything for 1960." Such programs, he pointed out, must be launched two, three or more years ahead of the need.

In his annual report, the vice president of NECA for District 5, G. C. White, devoted himself principally to the subject of good labor-management relations. His firm is the Empire Electric Co., of Fort Worth.

White observed that each year, "as our electrical contracting industry gets a little older, it gets more complex as advances are made in its many applications, and the mechanics of doing business get more complex due to the many laws and regulations which have been passed, and which affect our industry as well as most other industries.

"Under such conditions it is only natural that we sometimes overlook and neglect one of our most important assets — good labor-management relations.

"That is one fundamental condition that we must maintain if we are to properly serve our customers and keep the electrical industry in the hands of the electrical people."

Labor-management team

The district vice president then analyzed the two members of the labor-management team — IBEW and NECA. He said IBEW is a strong, well-managed and adequately-financed labor organization occupying a top position in the AFL. After enumerating the strong points of IBEW, he said:

"Even the best 'attorney for the defense' could not, however much he might exaggerate, present a case of economic strength for the electrical contractors which would make a favorable comparison with the one I have just outlined for IBEW. However, NECA today represents by far the best accumulation of economic strength the electrical contractors of the United States have ever been able to present."

After further discussing each unit and reviewing duties of each in labor-management relations, White concluded:

"The only place either organization can grow is in the chapters and the local unions, but this growth is often discouraged and delayed by lack of understanding and poor labor-management relations. Usually, where such a condition exists, we find individuals, and sometimes groups, in both organizations who forget the welfare of the industry and make snap judgements, or take actions on the spur of the moment while tempers are aroused, that work as a detriment to the peaceful atmosphere and cooperative effort that is the backbone of good labor-management relations and progress.

"We should never forget that good labor-management relations are just as economically important

to one group as the other, and should be considered so just as much by labor as by management, and vice versa. Today, good labor relations cannot be planted and left to grow without attention, as some seem to think. Rather, it is a plant that needs constant care and attention by men of good will from both organizations, who are open-minded and fair in their decisions."

First business session

Much of the first business session was devoted to film strips and discussions related to activities of the national research committee, with Irl Yeo, a committee member, in charge. His firm is the Yeo and Trubey Electric Co., Manhattan, Kan.

In discussing his "report of activities" of the committee, Yeo first explained the general philosophy of the conduct of technical and training services, saying:

"The research committee wishes to emphasize that distribution of the portion of the NECA budget allocated to NECA technical and training services is such that each service is proportionately maintained or developed in line with the extent of desire for and need of the improvement, expansion or initiation of a given service as indicated by NECA membership as a whole without disproportionate emphasis on any one service."

Following Yeo's report, he introduced in succession, L. K. Davis, Fisk Electric Co., Houston, and B. N. Voss, Circle L Electric Co., Tulsa, who respectively provided the commentary on two film strips, "Labor Cost Analysis to Assure Profits" and "Job Management for Profits."

This portion of the program was completed with a discussion of "NECA's Future Workshop Programs," by Charles J. Hart, cost data analyst for NECA.

Al Lindstrom, international representative, District 7, Fort Worth, had the subject, "Operation of the Non-Discriminatory Hiring Hall and Referral Procedure."

"There are probably few questions on the public scene that are more controversial," he began, "and produce more heated discussions."

Unions here to stay

He then arrayed arguments to demonstrate that "unions are here to stay" and said "there can be no effective collective bargaining without strong labor unions."

Thereafter, he traced his subject historically and when he had concluded Vice President White, serving as chairman, commented that the convention had never before enjoyed the privilege of such an effective review of the hiring hall and referral procedure.

Edwin Pewett, of the law firm of Weaver and Glassie, NECA counsel of Washington, D. C., proved so popular on the Tuscon, Arizona, program that he was back for a return engagement with the subject, "Legal Bid Depositories, State and Federal Anti-Trust Laws."

He said he preferred to leave off state anti-trust laws and concentrate on Section 1 of the Sherman act, enacted 69 years ago on July 2, 1890 and generally recognized or referred to as the American charter of economic liberty.

"You can be sure it will be enforced with vigor," he warned, pointing out that although it was conceived in a Republican administration, it had been strengthened by the Democrats. "It is here to stay."

Pewett added the Sherman act was first interpreted to mean that every contract or conspiracy that restrains trade is illegal. This interpretation has been modified to a degree in that "only every contract or conspiracy which unduly restrains trade is illegal." He continued by pointing out it would be wise to examine chapter procedures as related to the act.

"Intent is not a defense," he said, "and good intentions do not make unlawful contracts lawful."

Legal bid depository

Pewett declared his opinion that the "climate" is not right for further development of the legal bid depository and "we should rest on our laurels for a while," principal of these laurels being the St. Paul depository procedure.

Members of one of the convention panels devoted themselves to discussions and explanations of the licensing laws for the electrical construction industry in the six states forming the area with which the convention was concerned. Those who explained the licensing statutes and the states they represent were:

Arkansas, Jack Ketzscher, North Little Rock Electric Co., Little Rock; Arizona, Ernest E. Cannon, Cannon and Wendt Electric Co., Phoenix; Kansas, Jack W. Slaughter, Sands Construction Co., Olathe; New Mexico, John Yearout, Yearout Electric Co., Albuquerque; Oklahoma, B. N. Voss, Circle L. Electric Co., Tulsa.

Then Chairman Wm. F. Miller, Gulf Coast Electric Co., Baytown, Texas, called upon H. M. Bradley, Bradley Electric Co., Houston, sixth panel member, to make explanation for the fact that Texas has no licensing laws.

Bradley announced that Texas "had no such law at 9:30 this morning," explaining that a proposed law, originally sponsored by a home builders' group, was in legislative committee in amended form in the current session of the legislature. He said the proposal was thoroughly disapproved by the electrical construction industry of Texas and that the sponsoring group was "insulted" when spokesmen for the electrical industry suggested that the sponsors had no right to speak for the electrical industry. Bradley expressed belief that the electrical industry "has enough friends" to stop the bill.

Apprentice award

Following this panel presentation, there were brief remarks by Charles Paige, NECA chapter manager of Topeka, Kan.; Thomas P. McGinnis, apprenticeship and training bureau, U. S. Department of Labor, leading up to introduction of the outstanding apprentice from Kansas, James Howard, Topeka. Howard won an expense-paid trip to the convention and a watch was presented to him by Bill Damon, director of the national joint apprenticeship and training committee, who then addressed the convention on that subject.

"We need high skills and to get them we have to train men," Damon declared, the inflection of his voice giving urgency and emphasis to his remarks.

"Management recognizes that the first and basic requirement is a supply of trained men and management has an obligation to support this training program if they wish to stay in business; and they must support it if the craft is to be perpetuated and if we are to retain control of electrical installations. We need more apprentices!"

He said standards were being revised up to 1965, that a study of seven or eight years has proved materials must be uniform and that the type of journeymen needed is not being produced. He cited an attempt by "vocational people" to take over the apprenticeship and training program and asked

(Continued on page 129)

Some comment on electrical

By C. B. Grauer*
President
Southern Section, IAEI
Jackson, Miss.

◆ BY MAINTAINING membership in the International Association of Electrical Inspectors, you are performing a duty that is very essential in setting a standard for each and every facet of the electrical industry. You are assisting in the building of the National Electrical Code for the prevention of life and fire hazards and encouraging the use of equipment and appliances that have been tested by a recognized testing laboratory to insure safe use.

The National Electrical Code is a very important volume in the professional engineer's library. It is used to a certain extent to design the layouts and draw up specifications for jobs. Then it is up to the electrical contractor or journeyman to be able to interpret these specifications in order to deliver a safe job. How will you the contractor be able to do this? I will mention a few ways. You should attend all chapter and section meetings where the Code is discussed and read the association's bi-monthly news bulletins where you will find Code interpretations and diagrams.

A large majority of the electrical contracts are awarded without plans or specifications. Only a freehand sketch by the owner giving a vague idea of his wishes may be available. In such cases, a mechanic with thorough knowledge of the Code can give a much better and safer job at a smaller cost therefore meeting competition and gaining a satisfied customer.

The public utilities and their distributors are very active in the association. They can readily see that it is a very worthwhile organization striving to promote the electrical industry, an industry where efficiency plays a very important part.

Another facet of the industry is the electrical manufacturers and their distributors who are working constantly to improve their products. Naturally they are interested in the proper installation and maintenance to insure proper and safe operation.

Last but not least are the fire insurance companies who are vitally interested in the prevention of life and fire hazards caused by faulty or inadequate wiring.

Since the use of electricity has become so vital to our way of life, we sincerely hope if you are not now a member you will join the association and work faithfully with us to make America electrically safe.

*Mr. Grauer is an electrical inspector for the Mississippi State Rating Bureau, Jackson, Miss.

By M. D. Leslie*
Kansas City, Mo.

◆ YOU ARE perhaps an electrical contractor, architect, engineer, designer, or you may be engaged in the buying and selling of electrical materials. You may even be an inspector.

Eventually your work or your materials will come under the scrutiny of the electrical inspector in your city; or in the country if your work or business has to do with rural electrification.

You should really be interested and concerned about the type of person who will inspect and pass judgment on the work you do or the products you sell. The decisions of the electrical inspector can very easily cost you money and hurt your reputation. You have no recourse. The work you have done and the materials supplied may in your opinion comply with the Code but if the inspector rules otherwise you will have to make the changes needed to obtain approval and you will absorb the loss. Of course, if the Code has, without a doubt, been violated, it would be a different matter, and you would have no complaint.

Therefore in order that you may be successful and lead a peaceful existence you must know your business and be interested in the type of inspection under which you operate. And you must help through electrical associations, chambers of commerce, and similar organizations to study the operation of the inspection departments in a cooperative manner to secure the best kind of inspection service possible.

In the early period of electrical work and its inspection, it was customary to rely upon someone who had some experience in electrical construction work and who had some knowledge of physics and could talk about volts and amperes and ohms, and carry on an Aladdin-like existence with autocratic powers which were challenged by no one. He was viewed with awe by the inexperienced, and he made the rules whether or not there was a National Electrical Code available at the time. When the inspector took over, he generally decided what part or all or any of the Code would be used in the territory under his jurisdiction.

We still have a few inspectors who loudly shout that "you can't do that in my town," thereby setting themselves up as the final meaning of the law. We also have the political type of inspection service still existing in a few places. If you were on the right side of the political fence, anything you did that would work regardless of safety would get by. On the other side of the fence there would be nothing that you could do that would be passed.

There are cities today in which the chief electrical inspector is a political appointee who hasn't bothered to attend the meetings of the associations of electrical inspectors even when the meetings are held in his own town.

This kind of system is beginning to change. The chief electrical inspector is still a political appointee in some places, but the trend is toward civil service types of government with merit systems for the selection of employees. This

*Mr. Leslie was formerly chief electrical inspector for the city of Kansas City, Mo.

inspectors and inspections

has brought forth a new type of inspector who is concerned with the supervision of his department and the administration of its affairs; regards himself as an executive to administer the law as set forth in the Code; and who feels qualified to make decisions on matters not specifically covered by the Code. He needs practical experience in the work and technical knowledge to aid him in his decisions.

The use of the Code and the bad record of fires charged to poor electrical work and the widespread publicity given in magazines, newspapers and over the radio and television have made the owner of property and the user of electricity conscious of the necessity for good and adequate electrical work. The proper electrical work in the construction of modern buildings is big business and no longer a gadget or toy. The work is planned by architects and engineers well trained and qualified to make the designs and the work is done by contractors whose function is proper construction in accordance with the engineering design.

We now come back to the present-day inspector, in progressive places. He now examines plans and specifications and passes upon them before a permit to do the work is issued. Following this, it is the job of the deputy inspectors to see that the work is installed according to the plans and specifications. Of course, we have remodelling jobs that are frequently done without any serious planning. In such cases it devolves upon the deputy to get the best job possible done.

Now what kind of a man do you need for the position of inspector? You should be interested to see that he has some technical knowledge, preferably a graduate engineer. He should have "worked with the tools," as the craftsmen say today. He should know something about the contracting business and should be qualified as an administrator, and know how to handle the public and the men who work under him. He should have adequate pay.

How are you going to help get such inspection? It is not easy but you can do something by getting committees appointed to examine the present procedure for the selection of inspectors; and if you find places where improvement can be made, get cooperation from those in authority and tell them what you think should be done. Work with them in the preparation of ordinances and do not go over their heads unless you find them unresponsive; and if this happens, go to the top of the list and get busy in the next election to secure a merit system of inspection instead of one that is primarily political.

It involves a lot of work but if you meet with any success you will feel greatly rewarded because of your accomplishment.

By R. E. L. Shirley
Field Supvr. of Distribution
Georgia Power Co.
Atlanta, Ga.

(Following are excerpts from an address before the Georgia Municipal Association by R. E. L. Shirley, field supervisor of distribution, Georgia Power Co., who pointed out the reasons why municipal administrations should support their electrical inspectors' membership in the inspectors national association.)

◆ YOU MAY WONDER why an electric utility employee is interested in the inspectors' association. The answer is that we are selfish in that we want our customers to obtain the best possible use of the electricity which we sell. We want their wiring and their appliances to be safe and satisfactory so they will use more to their and our economic advantage.

In locations where there are reliable inspectors we feel that in looking after the customers' needs the inspector is also looking out for us as well. In locations where there is no inspection service the electric utility is distinctly at a disadvantage. We are placed in an embarrassing position of connecting up to wiring and equipment which has not been checked and approved by an experienced person. We do not want to be inspectors and feel that this is a local governmental regulatory matter.

Aside from our own special interest as a utility company, why should there be electrical inspectors? Here, I believe, are the most important reasons:

(1) To see that the public is adequately protected against loss of life and bodily injury from wiring and electrical equipment.

(2) To see that all buildings and structures are adequately protected against fire and other hazards involving the use of electricity.

(3) To protect the public against unscrupulous contractors, against inferior equipment, or inadequate service.

(4) To reduce cost of fire insurance by reduction in fire hazards.

Second, why should an inspector be a man of character and principle?

(1) Because his decisions affect life, property, cost of wiring, cost of fire insurance, etc. These decisions affect many people from an economic as well as from a safety standpoint. Decision would not be respected if, those who had to carry them out lacked faith in the inspector's judgment and character.

(2) Without character and principle a man does not usually avail himself of the necessary technical information to render proper decisions. In other words he does not keep himself qualified.

Third, does the cost of providing an adequate inspection service represent a total outlay of public funds?

No. The general practice is to levy reasonable and nominal inspection fees for inspection work and the collection of these fees usually just about offsets the gross cost of the service rendered.

Most of you here will no doubt admit the following things about electric power:

(1) Every structure today uses electricity, and in many cases elec-

(Continued on page 129)

The James Buchanan Duke Library building on the new Furman University campus, Greenville, S. C., where Edwards fire detection, clock and program, and communication system were used.

From left, Tommy Ayers, Sullivan Hardware; Bill Dearman, Davis Mechanical Contractors; Al Phillips, Sullivan Hardware; and Bill Kreidler, Edwards representative, discuss blueprints for library.

Partnership selling program stresses

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✓

◆ SOUTHERN electrical contractors are becoming more than installers as the result of a new program by a signaling manufacturer. The manufacturer has come up with a program to help southern electrical distributors help their electrical contractor customers do more business. In order to tap the big signaling market, Edwards Company distributors are not only providing answers to signaling problems, but also "fast quote" service on bid jobs, quick deliveries right from stock on signaling equipment, merchandising aid, and extra service in the field.

How has this program helped southern distributors and contractors on signaling jobs? One good example is the campus of Furman University, where a contractor organization and distributor firm teamed up on a signaling job.

Tommy Ayers, of Davis Mechanical Contractors, Greenville, S. C., the electrical contractor, sums it up this way.

More than installers

"We first learned from the 'specs' what the University needed. Working with an Edwards distributor, we recommended fire detection, clock and program, and two-way room communications systems that would qualify. With the assistance of the distributor we prepared quick estimates . . . offered quick delivery . . . got the job . . . and put the systems in. This new plan helps us perform a needed service for our customers . . . makes us more than mere installers.

Alvin Phillips, manager of the distributor firm (Greenville Electrical Div., Sullivan Hardware Company), was just as enthusiastic:

"From our viewpoint, the Furman job shows how the manufacturer's program helps us get closer to our contractor customers. In fact, what got us this job was just plain old fashioned know-how."

Phillips was referring specifically to the unusual 800 room communications system—just one portion of the entire signaling installation. It is thought to be the largest of its kind ever built, and was designed especially for a Furman dormitory. The unique panel serves the same purpose as a telephone in each room, but at much lower cost than if individual telephone service was installed and maintained.

As Al Phillips puts it: "Because of this plan we were able to give Davis Mechanical what they needed to do the job right."

The plan that both men were talking about came into being

On the job consultation between Bill Kreidler (left) and Tommy Ayers helps to solve problems as they arise. Ayers feels that this new program makes his company more than just installers.

Tommy Ayers (left) and C. T. Branyon, electrician (right) of Davis Mechanical Contractors, check over the 800 room two-way communication system with Bill Kreidler (center).

teamwork to increase signaling sales

when the Edwards Company made a survey of contractors and distributors in the South and in other parts of the country.

Growing in the industry

Perhaps the most significant thing Edwards learned from the survey was that both the number of signaling products, and their complexity, is growing. Already a multi-million dollar industry, signaling equipment is a solid source of business for contractors and distributors and is still growing.

Over the years the signaling needs of schools, hospitals, homes, industry, and offices has greatly increased, and signaling equipment has kept pace with this growth. For example, in its 86-year history the Edwards line has expanded into over 1,800 different products using more than 22,000 pieceparts—including such items as horns, bells, transformers, buzzers, push buttons as well as complete fire warning, paging, clock, and hospital signaling systems.

It was obvious that these days electrical distributors and contractors have to know more in order to sell more. Information about modern signaling equipment and also how to sell it was what was needed, and quickly. So, besides technical and product information, Edwards Partnership Sales Plan and the Better Selling Kit (which grew out of the plan) includes displays, promotional aids, direct mail folders, demonstrators, periodic tips on products and markets, and even a method for helping distributors to keep a balanced inventory.

"We are attempting to provide ammunition, so contractors and distributors can do the creative job of which they are capable," says Robert L. Kempton, Edwards general sales manager.

Setting up the program

In each case, the Partnership Plan begins when a distributor signs a balanced stock order (to make sure increased contractor orders generated by the program can be quickly filled from stock) and names one of his own key people as the signaling specialist to coordinate the program. This guarantees that a qualified person is always available to handle signaling problems—from the installation of a home fire alarm to a complete nurses call system in a hospital.

Next, an Edwards field representative takes an inventory of present stock on hand, and institutes an inventory control system. In addition, a number of inside and outside distributor salesmen are registered to receive educational material on signaling products regularly.

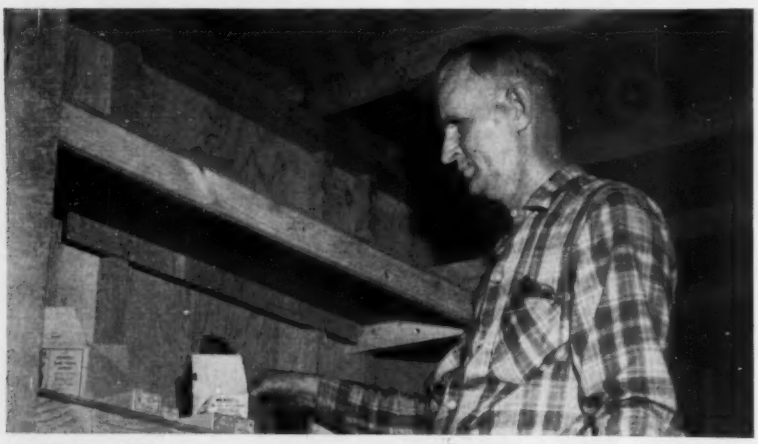
As in the past, the distributor can continue to call on Edwards field representatives (many of whom are engineers) located throughout the country for assistance with special problems. These representatives also work with contractors on installation prob-

(Continued on page 132)

This portable tool house was designed and built by Jackson Electric Co. The custom-built trailer is pulled by a pick-up truck. The tool house is 7 by 14 by 7 feet. The frame is made of 2 by 4 studdings. The curved roof is of galvanized sheet metal.

New ideas in economical tool houses

W. Malcolm (Red) Jackson, who designed the house and trailer, indicates where two-inch pipe is used to load and unload the house.



Built-in shelves add to the convenience of the portable tool house. The floor and sides of the house are of weather-resistant plywood.

By Wendell O. Givens

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities
Electrical Wholesalers
Electrical Inspectors
Industrial Engineers
Consulting Engineers

◆ TWO ELECTRICAL contractors in Birmingham several months ago examined the time-consuming and often expensive problem of tool houses. They came up with different but apparently equally effective solutions.

One is a portable tool house with custom-built trailer. The other is a collapsible tool- and store-house to which additional units may be attached with a handful of bolts.

Both type houses are described by their designers as adequate, economical, and simple to duplicate.

W. Malcolm (Red) Jackson, owner of Jackson Electric Co., designed and built the portable tool house and trailer. Lyle E. Johnson, owner of the Lyle E. Johnson Electric Co., designed and built the collapsible unit.

Mr. Jackson's portable house is 7 by 14 by 7 feet. The frame is made of 2 by 4 studdings, the curved roof of galvanized sheet metal, the floor and sides of weather-resistant plywood. For longer life, the house is painted after each job.

(Continued on page 132)

Installed in underground ducts, Paranite Super Pararite-Paraprene® network cable services a modern electronic computor installation.

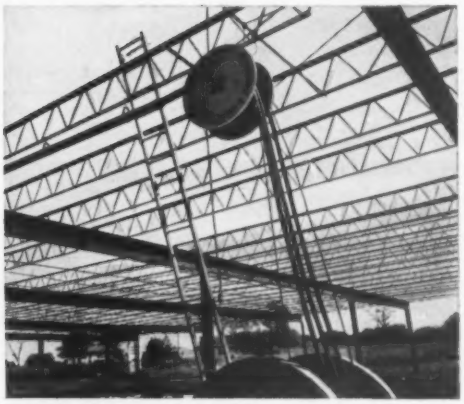
Paranite Super Pararite-Parasyn cables carry primary power between transformers and switchgear control panels in an ore reduction plant.

Across the nation for trouble-free installations...

PARANITE®

"IF IT'S PARANITE IT'S RIGHT"®

Paranite Super Pararite-Paraprene cable serves as the primary transformer feeder in a new municipal water pumping station.



Overhead duct installation of Paranite Super Pararite-Parasyn® (PVC) serves as a secondary feeder cable in a manufacturing plant.

The consistent selection and performance of Paranite cables from 600 volt network through 23,000 volt power cables mark them as products of close quality control. These Super Pararite-Paraprene and Super Pararite-Parasyn (PVC) cables illustrated above, indicate the versatility, national availability and proven trouble-free performance of Paranite installations.

PARANITE WIRE AND CABLE DIVISION

Essex Wire Corporation, Fort Wayne, Indiana

MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Birmingham, Ala.; Anaheim, Calif. • Sales Offices in All Principal Cities

Equipment displays save time for contractor

This display was so popular that it was borrowed by the schools and local public utility.

By L. H. Houck

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers
- Consulting Engineers ✔

◆ ELABORATE EQUIPMENT displays set up by Harold Howerton, owner, Howerton Electric Co., Jefferson City, Mo., have saved him thousands of words of explanation and helped to capture bigger contracts, too.

For example, almost every contractor has had trouble explaining to a non-technical customer why he should buy a 100-ampere entrance job, or even a 200-ampere service installation instead of a 60.

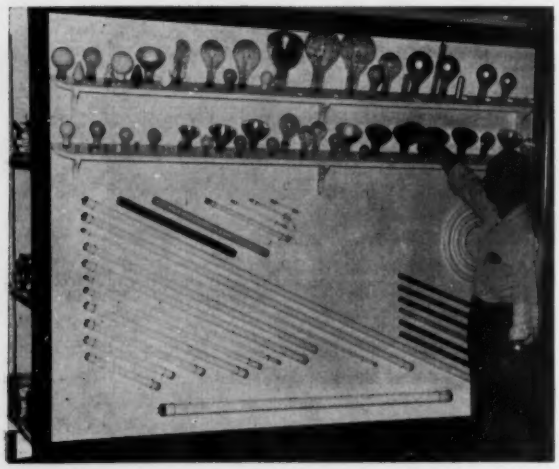
Howerton made a simple portable display to demonstrate the need for wiring adequacy, and it has been so successful that it has been borrowed by the utility for use in its demonstrations and also used by schools.

This particular display shows system from service drop and meter to usage center and a 200-ampere circuit breaker, which he calls the Housepower center. Red ribbons branch out from the circuit breaker to receptacles, such as lighting, air conditioning, range outlet, and fryer outlet, showing the use of both 110- and 220-volt appliances.

Even the most inexperienced person can see that you need to have the power in the Housepower center before you can take it out. Howerton found that most women grasped the idea immediately. When it is needed, he has no trouble at all getting an owner to order a 200-ampere service.

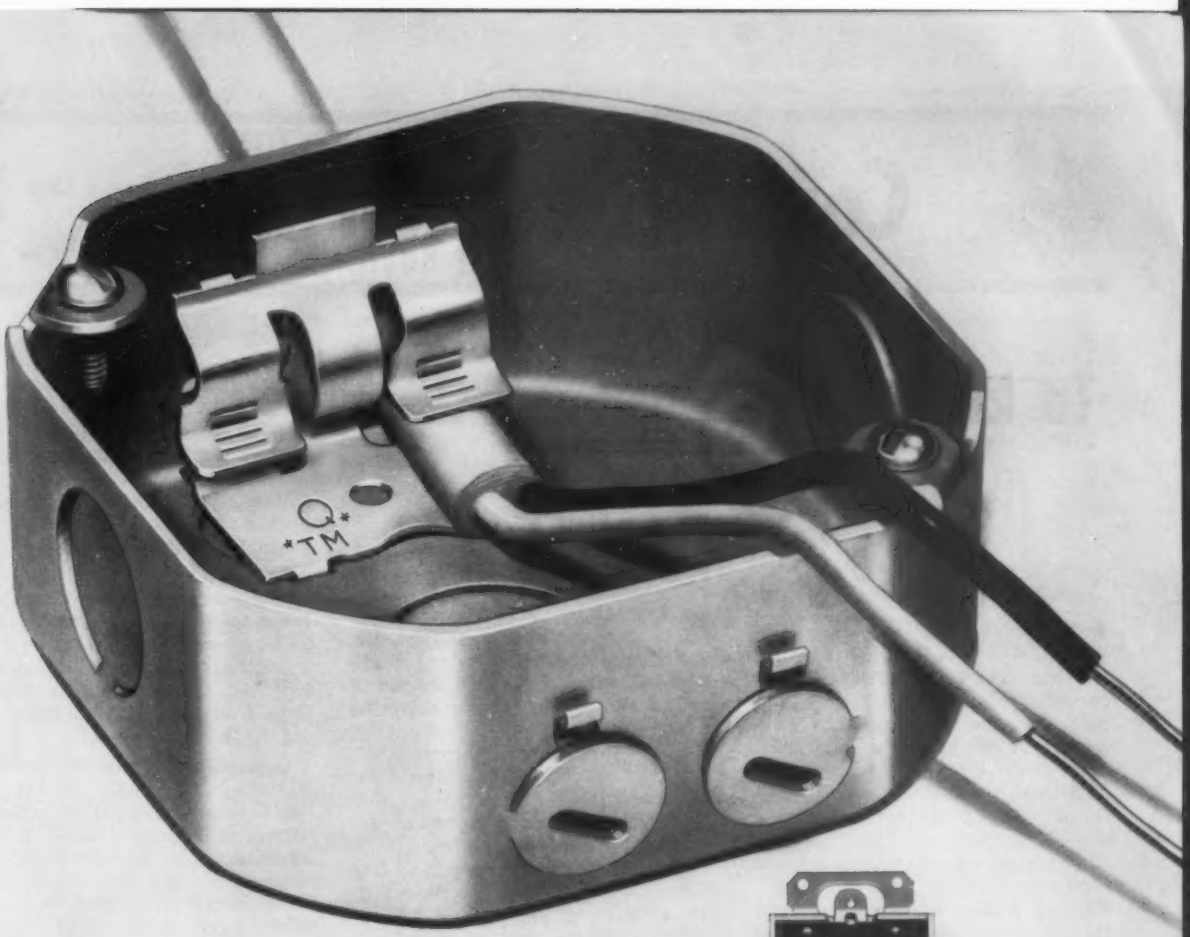
The success of the adequate wiring display was so great that he made a large permanent display of switch boxes in his store, although he seldom sells a switch box to an individual home owner.

(Continued on page 130)



Mahlan Goff, office manager, at the lamp display board. Most items are permanently mounted.

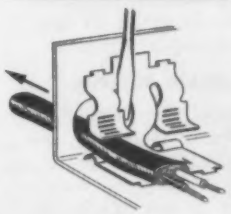
Jim Howerton, son of the owner, shows the display of switch boxes, circuit breakers, and similar equipment.



New RACO "Q"* Quick-Clamp can save hours on the job

"Q" Quick-Clamp available in RACO switch or outlet boxes

Cable moves freely into clamp and is gripped tightly



To back-off cable, release clamp pressure with screwdriver

With RACO's New "Q" Quick-Clamp you can install non-metallic sheathed cable in seconds. Simply push the cable through "Q" Quick-Clamp. Cable is held firmly in place, can't be pulled out until clamp is released. To release the cable, apply a little pressure under the clamp with your screwdriver. With the new "Q" Quick-Clamp there will be no more lost time tightening and loosening cable clamp screws . . . no more stripped screw threads.

And . . . you'll save an hour or more on the average job (60 to 100 boxes per house). Your RACO Distributor has the New "Q" Quick-Clamp Switch and Outlet Boxes. They're revolutionary, yet so simple to operate. (Exceed Underwriter Laboratories' tests; are fully protected by patents.) See them and try them now.

*Trademark

ALL-STEEL EQUIPMENT INC. Aurora, Illinois

Contractors tell how

To know your men--teach them

J. Arthur Turner, Sr.

President
Tampa Armature Co.
Tampa, Fla.

◆ THE SUCCESS of any shop rests with the men who do the work: In that sense the men and the owner are partners. To the extent that the mechanics do good work and the boss is a good manager, they all profit.

To insure that our men understand their jobs, we conduct a school within our plant, with classes running two nights a week for a period of three months. Various phases of our diversified service work are discussed, and mechanics are encouraged to ask questions. Very often, the calibre of the mechanic is revealed in the type of questions he asks, as his proficiency, or lack of it, is revealed in the work to which he is assigned.

If only for this factor alone, any contractor who works from 8 to 10 men and up, will find such a "school" worth maintaining.

It is not our intent to make electrical engineers out of our mechanics. For this reason, we shy away from instruction in mathematics, which, more than any other subject, tends to bog the class down. And the average mechanic does not need any extensive knowledge of mathematics, anyhow. What he needs is the information to supplement his practical experience, in order to help him turn in creditable work.

Discovers men's abilities

Since classroom responses help to discover men's abilities, we can better channel their efforts into the kinds of work for which they seem best fitted. While attendance is on a voluntary basis, the fellows who are conspicuous by their absence are also conspicuous when it comes time to evaluate their services to the shop.

This is a psychological factor of no mean value in assuring well-attended classes. On the other hand, the individual who thus exhibits the desire to acquire the knowledge that is needed, often beyond the immediate requirements of his job, certainly merits recognition.

Our school is the outgrowth of the high cost of labor. There is an understandable reluctance on the part of customers to pay $3.35 an hour labor charge for a mechanic who is obviously inexpert at his task. When you send a man out on a trouble shooting job, his work, attitude, and performance must convince the customer he is getting full value for his money, if his gripes are to be resolved happily. Certainly the customer is apt to resent, and rightly so, the mechanic whose halting techniques are running up the cost. It is up to the contractor to make sure that his men know their business.

A school helps reveal this hard fact.

Interchange of information

If—as with us—a contractor's work lies largely in the field of trouble shooting and repairs, the classroom serves as medium of practical interchange of information calculated to make each man more proficient at his task.

In our own case, we serve the needs of phosphate mines, dolomite plants, cement industries, dredges and draglines, and the repair of electrical equipment in ships that arrive in the Tampa port from all parts of the world. If men are to operate efficiently in these areas, they need to know every wrinkle our other shopmen have garnered through their experience on these varied jobs.

In the relaxed atmosphere of the classroom, such information gets across. Even the most conscientious employee cannot do justice to his work without a comprehensive knowledge of its various facets. You can assure him of this through these class clinics. Secure in his knowledge, the mediocre man becomes a good man; the good man an expert.

It is certainly incumbent upon the employer to thus take his men to heart and make them familiar with the type of equipment they will be called upon to service. This is of especial significance in the field of wiring.

Our experience is that the contractor who installs the equipment is usually called upon to service it in case of trouble. Thus he has an edge on his competition, since he already has a foot in the customer's door. Which means he must have men with the requisite, well-rounded experience. Supplemental classroom instruction is of the highest value at this point, especially when it comes to fast trouble shooting of industrial equipment whose outage may seriously endanger production schedules. It is here that speed is of the essence if the contractor hopes to be remembered for future work.

Obviously he will also be remembered if his men are not equipped for their jobs!

Each man you send to a job is a salesman for you. By his actions at the job site, he is either an ambassador of goodwill for your organization, or he is tearing down the reputation you may have painfully built. The classroom can teach him the meaning of practical skills along with the meaning of good public relations.

The development of any business is impossible without the addition of manpower. Run a school and get to know your men and what *they* know. If you are making a bid for service work, you will find that particularly when it comes to dealing with commercial accounts, that high labor costs may be soon forgotten in the light of expert performance.

DIRECT BURIAL OF TRIANGLE TRIOPRENE RR CABLE gives low-cost trouble-free systems

It wouldn't be a good practice to bury any RR cable directly in the earth where mechanical damage might cause an outage. BUT, in practically all other situations involving voltages up to 5000 volts, contractors and engineers are finding this versatile power and lighting cable pays off in installation savings and trouble-free service.

Protected by a Trioprene sheath, Triangle's special neoprene compound, RR Cable is flexible, lightweight and tough. It has good aging and heat resisting properties, and is designed to give long-time trouble-free service. It's easier to handle, splice and terminate than metallic sheathed cable. Its first cost is less, and it requires neither conduit nor ductwork under most conditions. In addition to direct burial, RR is also suitable for aerial and duct installations.

Find out more about this versatile power cable.
Write for a copy of the Triangle RR Cable folder.

Buy right—buy from your distributor

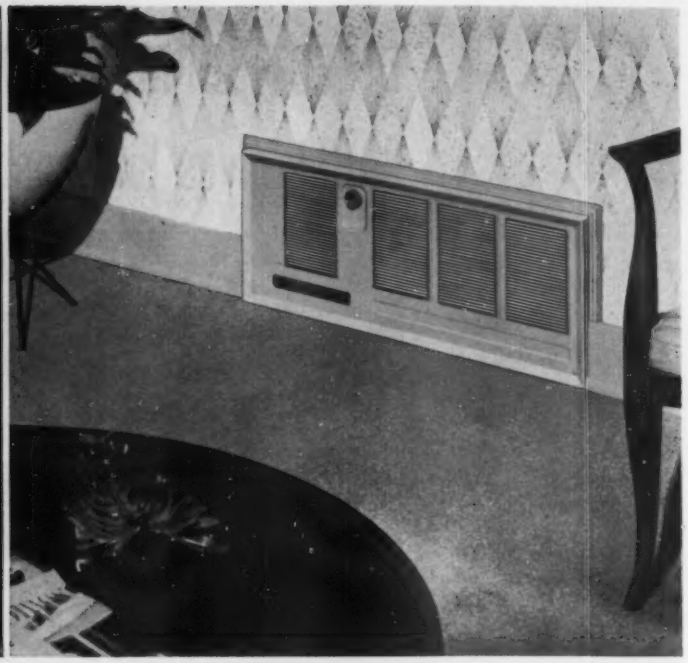
TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

"It MUST Be Right!"

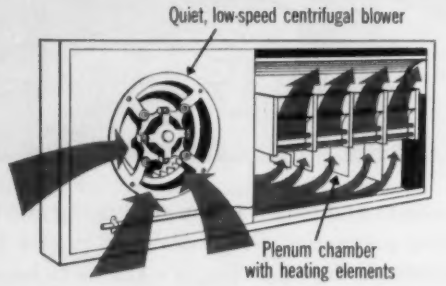
R&M-Hunter combines best features of Electric Baseboard and Forced Air Heating

New Forced Air Baseboard gives balanced heating at less cost than other electric systems



The new R&M-Hunter FORCED AIR BASEBOARD has definite, salable advantages over other heating systems. It costs much less than convection baseboard and is easier to install. No expensive accessories, no parts to assemble. Produces warm comfort throughout living zone—no cold air at floor level or "heat pack" at ceiling.

ENTIRELY NEW PRINCIPLE GIVES PERFECT CIRCULATION



Centrifugal low-speed blower pulls in cool floor-level air and delivers to subdivided plenum chamber over coil heating elements. Here air is heated and distributed evenly into room with uniform velocity across discharge grille.

Complete safety—Discharge grille is safe to touch. Electric current shuts off automatically when grille is removed for cleaning of interior.

Independent zone control—Individual thermostats provide amount of heat desired for each room. Located in unit at floor level for fast response. One thermostat equipped model will control two or more units in a room.

Quiet operation—Special design centrifugal blower with low-speed R&M motor operates very quietly.

Engineered for compactness—Dimensions: 33" long, 13" high and 3⅞" deep, mounted against finished wall. When recessed, unit extends only 1¾" from wall.

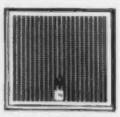
1000 to 4000 Watt capacities—There are 6 capacities of the Forced Air Baseboard to match varied heat requirements. 1000, 1500 and 2000 Watt models are available with or without thermostats. All 2500, 3000 Watt models and a commercial 4000 Watt model have thermostats.

Write for full details: HUNTER DIVISION-ROBBINS & MYERS, INC., 2516 FRISCO, MEMPHIS 14, TENN.

R&M HUNTER ELECTRIC HEAT *It's Matchless!*

FORCED AIR BASEBOARD

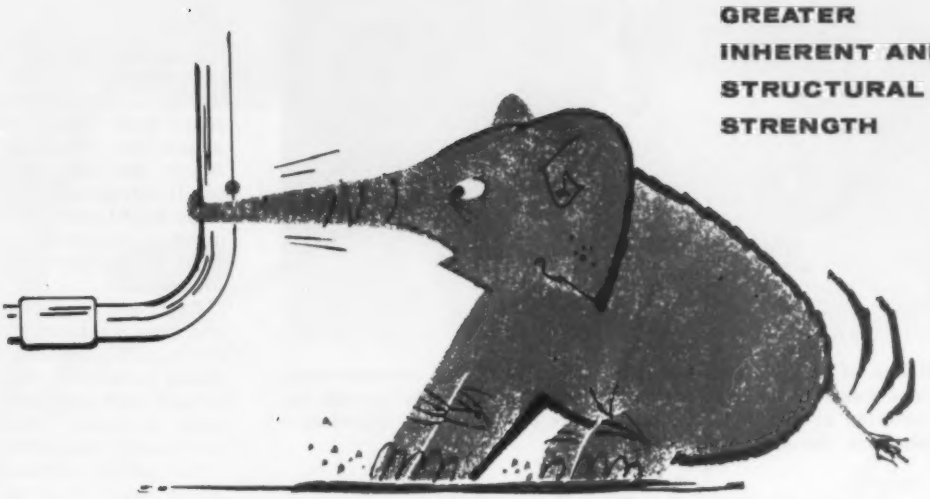
Other Electric Heaters by R&M-Hunter


WALL HEATERS

CONVECTION BASEBOARD

BATHROOM HEATERS

Live better . . . electrically



this is one of the 10 reasons why

STEEL

CONDUIT IS BETTER

1 Greater inherent and structural strength
2 No special exterior preparation needed for concrete installations
3 Takes toughest punishments during construction
4 Uses standard tools and accessories
5 Easier to fish with a tape
6 Compatible with all building materials
7 Great resistance to corrosion and alkali reaction
8 Greater protection of conductors after installation
9 Immediate delivery from distributors and mills

10 Proven for more than a half a century in millions of installations

CLAYTON MARK, pioneer in electrical conduit since 1910, specializes in producing steel conduit that meets all building specifications. Our facilities, engineering and production know-how guarantee quality products accepted as "The Contractors' Favorites" in the industry—Electrictube, Hotkote, Galvakote and Enamelkote.

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Clayton Mark & Company
1900 Dempster Street, Evanston, Illinois
Please send me your booklet
"Why Steel Conduit Is Better"

Name_____

Address_____

City_____ State_____

CM-4810

Richard Reeve of Crook-Dunn Electric Co. shows how a too-deep floor box problem was solved. The cover from the 3½-inch floor box on the left was adapted to the 1½-inch outlet box on the right, allowing a flush finish with the 3-inch flooring.

Regular floor box adapted to 3-inch concrete flooring

◆ MANY CONTRACTORS probably are running into the problem of regular floor boxes being a little too deep for the three-inch concrete flooring used today.

Crook-Dunn Electric Co., of Birmingham, was faced with the problem in installation work on the expansion of the Social Security office building in Birmingham.

As explained by Richard Reeve, superintendent for Crook-Dunn on the job, the problem was solved by combining the cover of the floor box Crook-Dunn normally uses with a 1½-inch outlet box.

The floor measured 2½ inches from the top of the corruform where the floor box rests. Crook-Dunn's regular floor box was 3½ inches deep.

So, instead of buying the full box, Crook-Dunn bought the 1-inch brass cover, which is adaptable, and substituted a 1½-inch deep octagon 4-inch outlet box, thus assuring a flush finish with the slab. The cover is adaptable to either flush receptacles or the stand type.

Grounding wire needed on all electrical home appliances

By C. C. Cole
City Electric Co.
Greenville, S. C.

◆ A TREND in the electrical manufacturing industry I am particularly happy to see is that of putting a third or ground wire on appliances and outlets. At the present time some companies are taking the lead in putting a ground wire on home appliances, but I would like to see all the manufacturers follow this practice. If they will not do it voluntarily, then perhaps legislation should be introduced to make it a mandatory requirement.

Since my business is concerned mainly with residential work, I am very conscious of the need for greater safety in the home.

It has not been too very long since a workman was accidentally electrocuted while doing some repair work in the basement of a Spartanburg home. The cause of his death was traced to an ungrounded refrigerator standing on the damp concrete floor. There are some local laws governing such appliances standing on concrete floors, but the law should apply to all refrigerators because conditions might arise which would require a refrigerator to be moved from a safe place to one not quite so safe.

Even seemingly harmless things like record players should be made more safe, because every day young people are taking them out to back yard pools and other recreation grounds. These things are potentially dangerous.

Hot plates, especially the low-priced ones, ought to be made to have a ground wire as standard equipment.

Many improvements have been made toward electrical safety in the home, but much more work needs to be done.

Accurate estimates a guide to standard charges

By Leonard H. Harkness
Engineer and Estimator
Hitt's Electrical Service, Inc.
Rockville, Md.

◆ WE BELIEVE that estimating is the heart of a contracting business. Convinced that every job merits an accurate estimate and that there is no shortcut in estimating, we have devised an estimating practice we believe unique in a non-union area. Our approach is to break a job down to its component parts and compute costs of the various portions of a job that go into the total job. It has helped us establish standard charges for our shop for particular phases of work unique to a job. This provides us at any time with informa-

(Continued on page 129)

"ONE LOOK ABOVE THE CEILING LINE WILL TELL YOU WHY SPEEDOMATIC IS TODAY'S FASTEST-INSTALLING TROFFER!"

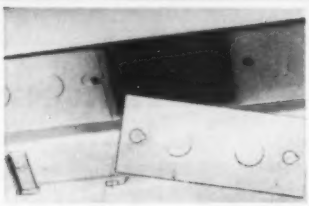
new *Smithcraft* SPEEDOMATIC TROFFERS

WITH THE EXCLUSIVE TELESCOPIC DOOR FRAME

It's no secret that the aptly-named new Smithcraft Speedomatic is today's fastest-installing troffer! From the telescopic door frame — that expands or contracts to assure perfect fit, even in irregular ceiling openings — to the large access door for fast, easy wiring, the new Speedomatic troffers are contractor-minded . . . designed to save you hours and dollars. Compare for yourself — and you'll agree that Smithcraft Speedomatic is truly the fastest-installing troffer on the market today.

THESE FEATURES HELP TO SPEED INSTALLATION TIME!

Exclusive telescopic door frame assures perfect-fitting jobs every time. Shallow design — only $4\frac{15}{16}$" deep.



Exclusive wiring access door saves installation time — large enough to reach through for feed wire.

Troffer installs in seconds, from below, by fast-travelling levelling screws. Only tool needed is a screwdriver.

Smithcraft Lighting **CHELSEA 50, MASS.**

FREE! The Smithcraft LIGHTESTER . . . enables your customers and prospects to "grade" their own lighting! A creative selling aid for you! For your sample LIGHTESTER, fill out and mail the coupon.

Smithcraft Lighting Chelsea 50, Mass.

ES 6

☐ Please send me a FREE sample LIGHTESTER and complete information on how I can use the LIGHTESTER to increase my sales.

☐ Please send me the complete Speedomatic catalog.

NAME .....

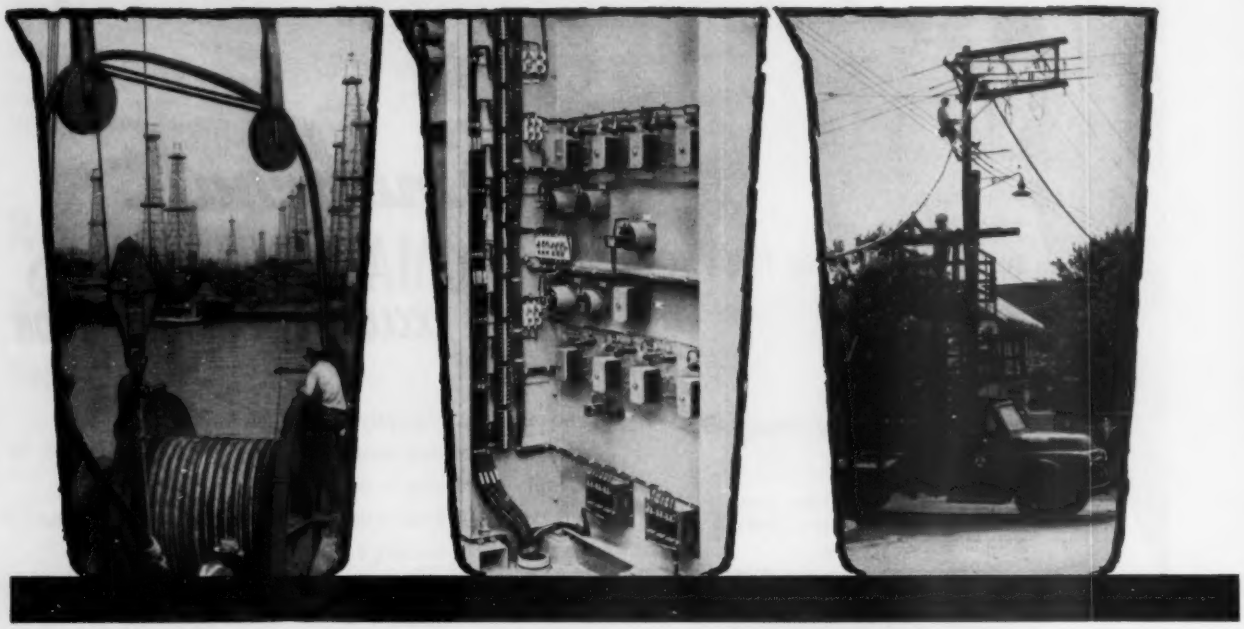
COMPANY .....

ADDRESS .....

CITY ..... STATE .....

from the
laboratories of
General Cable...

PREMIUM QUALITY INSULATION COMPOUNDS



AQUASEAL

low SIC, superior, rubber compound that is heat and water resistant, used on single and multiple-conductor cables at ratings up to and including 2KV a-c or d-c. Recommended for dry, alternately wet and dry, and continuously wet locations, subject to a-c or d-c potentials at either polarity, and at a maximum conductor temperature of 75C.

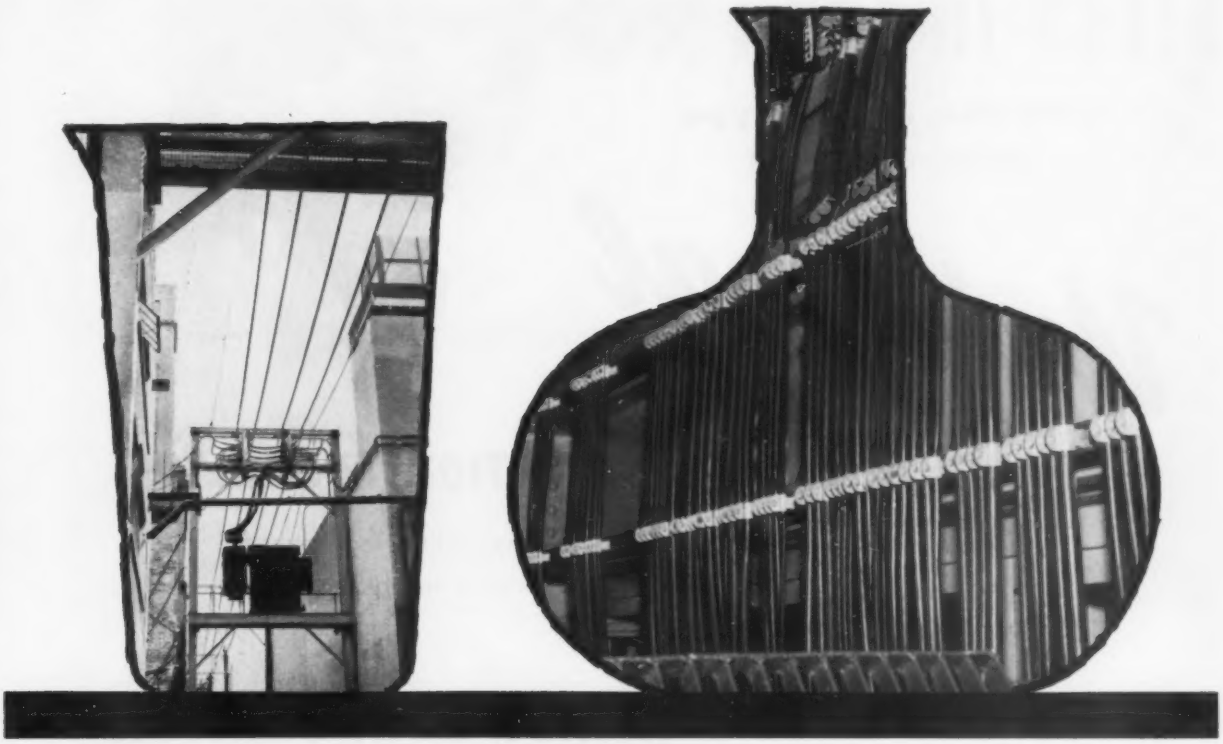
GENCORONE

high-voltage, ozone-resistant insulation of the oil base type, with exceptional physical and electrical stability. Resists the effects of moisture, sunlight, weather and earth solutions. Permits liberal current ratings consistent with maximum continuous operating temperatures of 75C for 8KV service or lower and 70C for higher voltages.

BUTARONE

high-voltage, butyl-base compound with exceptional resistance to ozone, low water absorption, and excellent resistance to heat. Suitable for both low and high-voltage applications, it has excellent electrical stability and resistance to aging. Operates at 90C up to 5KV and at 85C at higher voltages.

In the modern General Cable laboratories, some of America's foremost rubber chemists create, test and evaluate new insulation compounds in a continuous program of research and development. Materials for standard service conditions and special constructions to satisfy unusual requirements have all proven their worth in superior performance in power and control cables over many years. A few of the basic compounds from General Cable's long list are briefly described on these pages.



THERMAX-W

and many other compounds in the rubber group are available for low and moderate voltage power cable service in wet locations, where high temperatures are encountered or where high current carrying capacity is required.

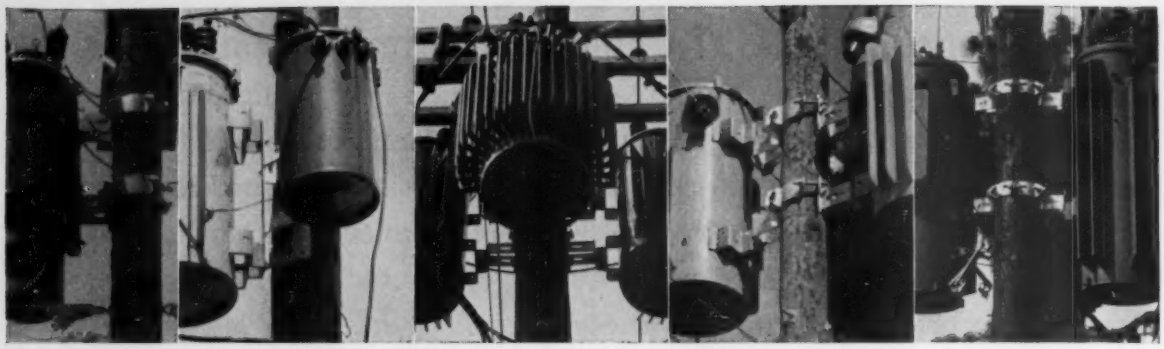
GENCASEAL (PVC)

in the thermoplastic group, as well as high-molecular-weight polyethylene, which is another outstanding General Cable thermoplastic insulation.

Offices and Distributing Centers Coast-to-Coast

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N.Y.

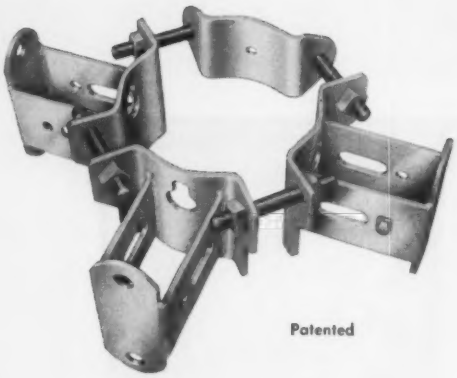
for quality and service specify... GENERAL CABLE



First in the Field

with the clamp-type cluster mount

Universal



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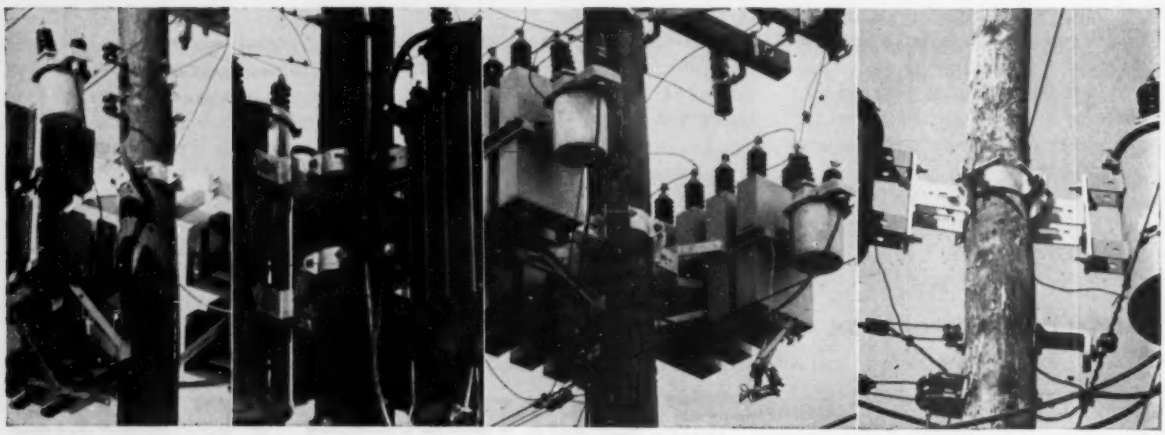
MOUNTS and CONSTRUCTION SPECIALTIES

. . . are being specified by more and more utilities everywhere because the UNIVERSAL line offers the most in safety, economy, versatility and modern design.

UNIVERSAL POLE BRACKET CORPORATION

P. O. BOX 8454 HOUSTON 4, TEXAS

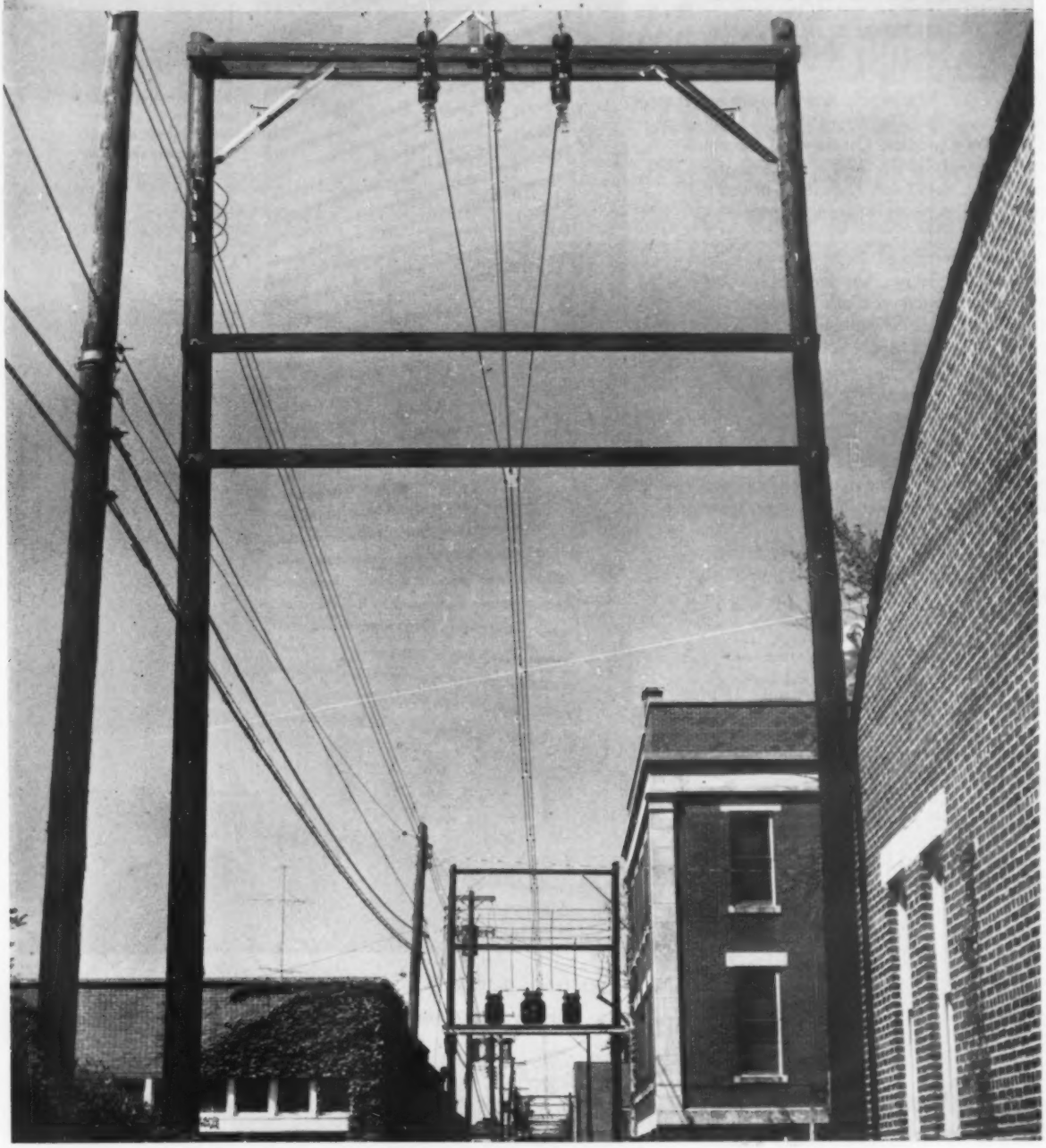


UTILITY ENGINEERING

Transmission — Distribution — Metering

Design
Installation

Testing
Maintenance



Aerial cable in modern distribution systems — see page 56

Dallas' NEW SOUTHLAND CENTER

supplied with 12,000 kva of electricity

Served by six Wagner Underground Network Transformers

Dallas' fabulous new Southland Center consists of the 42-story Southland Life Tower, tallest building west of the Mississippi, and the 600-room Sheraton-Dallas Hotel. A "City within a City," the Southland Center is an enormous consumer of electric power. For example, there is a 6,450 ton electrically-driven air conditioning system—fourth largest in the world!

Dallas Power and Light Company, who supplies this power, has installed six 2,000 kva underground network transformers in the basement of the building to assure continuous electrical service to the Center. The transformers were supplied by Wagner.

Wagner Network Transformers are built for installations of this type. They have a low noise level . . . they are small in size to fit in close quarters, and now have a compact switch and panel radiators for smoother contour and easier maintenance.

Wagner makes a complete range of transformers for industrial and power company needs. Consult your nearby Wagner Sales Engineer about your power distribution program. There are Wagner branches in 32 principal cities.

Southland Center has 296 miles of electrical wiring . . . 15,800 lighting fixtures . . . 28 elevators . . . 8 escalators and an all-electric company cafeteria.

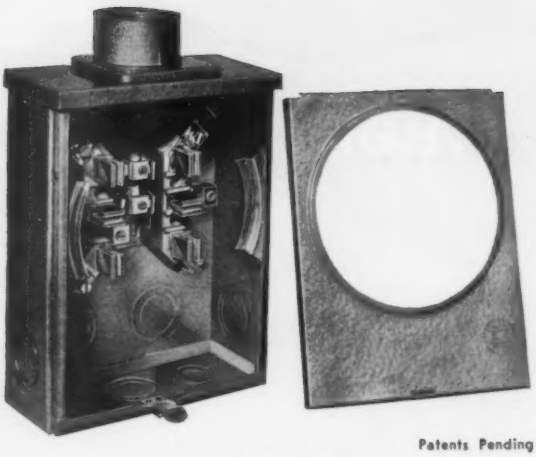
WT59-11

SERVING 2 GREAT GROWTH INDUSTRIES . . .
ELECTRICAL . . . AUTOMOTIVE

Wagner Electric Corporation

6440 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES



Patents Pending

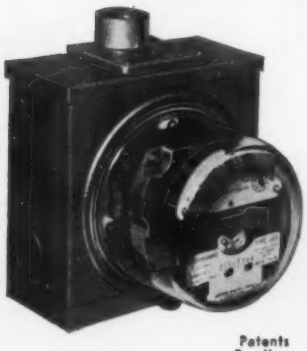
CATALOG-WVL-0175A-2"
SIZE 10½" x 8" x 3⅛"
175 Ampere Capacity
3-Gang Ground, 5th and 6th Terminals
Added Line Terminals for connection to other sockets

listen

. . . to what they are saying . . .

QUALITY WITHOUT QUESTION
REVOLUTIONARY - UNIQUE
FULLY TESTED & THOROUGHLY TRIED

ENGINEERED TO PROVIDE ALL THE ADVANTAGES YOU WANT AND NEED



Patents Pending

CATALOG-WV-011-A-1¼"
Size 8" x 8" x 3⅛"
Up to 100 Amp. Capacity

Positive corrosion protection . . . the complete enclosure is provided with a nonabsorptive oxide film after fabrication, then finished in a hard, durable, baked-on grey Hammertone Enamel . . . unexcelled performance!

B & C's

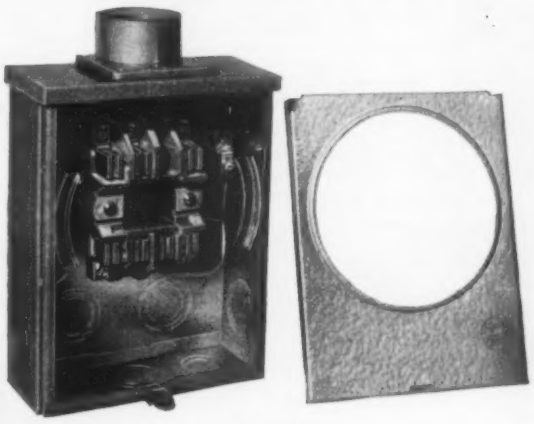
RINGLESS METER SOCKETS

. . . available in . . .

Light Duty
Medium Duty
Heavy Duty

Patents Pending

CATALOG WVL-0150A-2"
Size 10½" x 8" x 3⅛"
Up to 150 Amp. Capacity



Patents Pending

CATALOG WVL-1007-A-2"
Size 10½" x 8" x 3⅛"
7-Terminals — 100 Amp. Capacity

No Sealing Ring required! New Snap Latch sealing device. Interchangeable conduit hubs, and many additional flexible features. Stainless steel sealing latch and stainless rivets eliminates electrolytic deposits. Unique hinge terminals, pressure plate design, 4/0 capacity—straight-thru single or 3 gang terminals—5th and 6th terminals—semi-automatic visible by-pass—and many other features. . . .

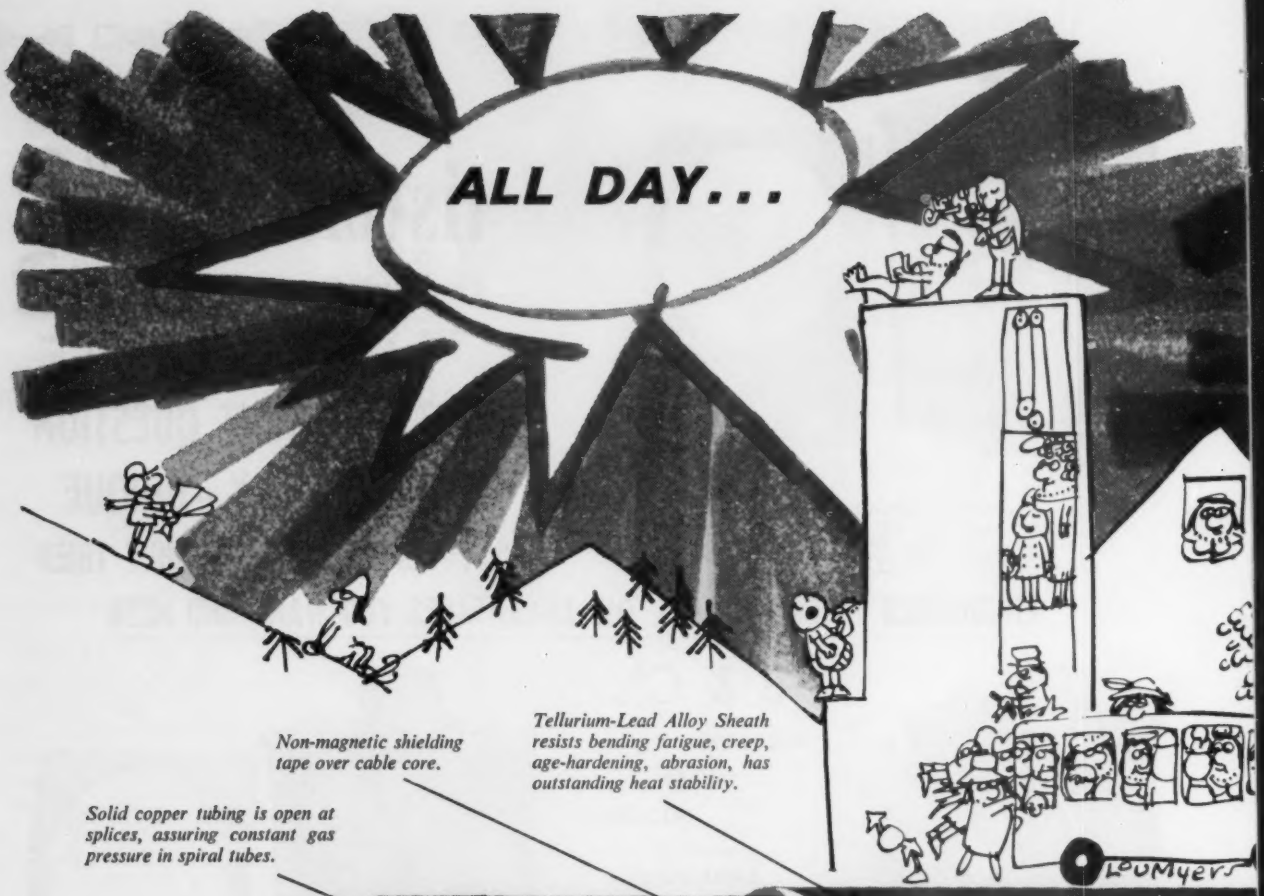
Write for descriptive catalog containing installation data and current price list.

B and C

Your Seal of Dependability and Safety

METAL STAMPING COMPANY

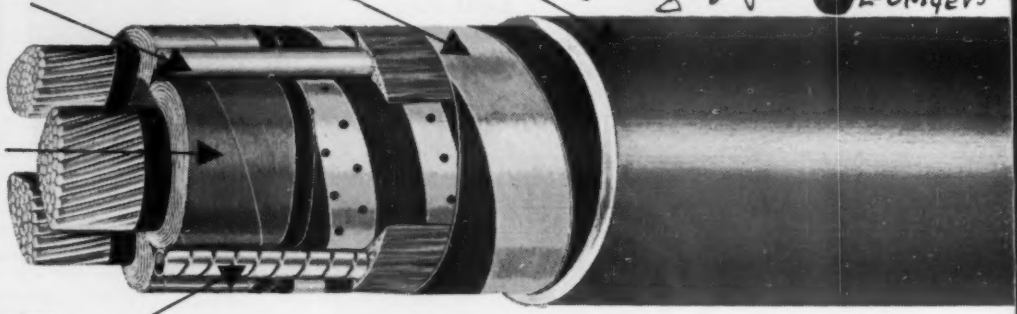
590 MEANS ST., N. W. • ATLANTA, GEORGIA



Non-magnetic shielding tape over cable core.

Tellurium-Lead Alloy Sheath resists bending fatigue, creep, age-hardening, abrasion, has outstanding heat stability.

Solid copper tubing is open at splices, assuring constant gas pressure in spiral tubes.

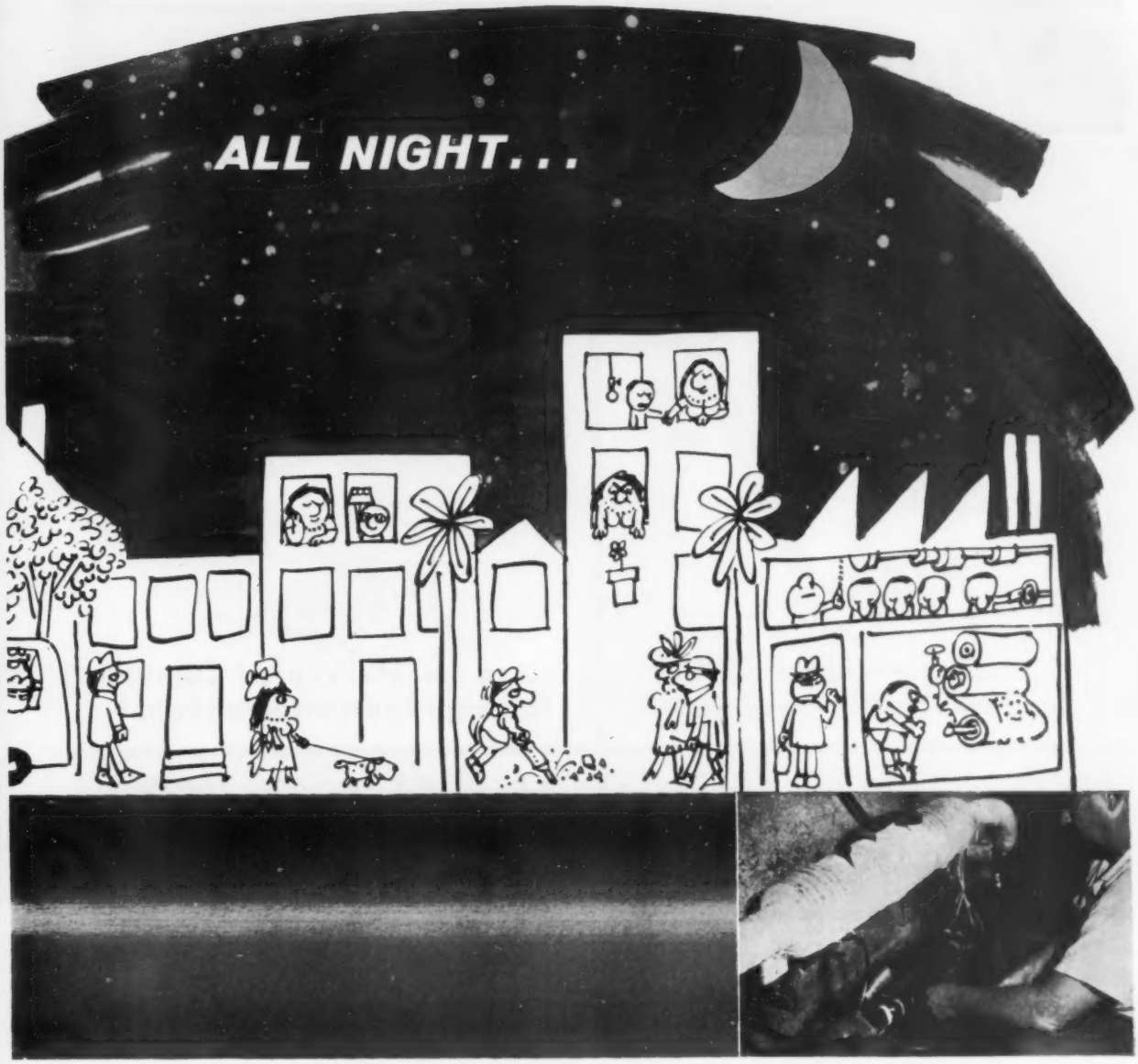


Impregnated paper insulation, with shielding.

Two steel spirals conduct inert gas to all parts of cable to prevent ionization and provide self-supervisory properties.

ROEBLING GAS-FILLED CABLE

gives "no-outage" service ...without relying on luck!



THE SHEATH ON THIS CABLE . . . is one more reason why it's a best buy! The Tellurium-Lead Alloy Sheath offers the best possible resistance to fatigue and age-hardening problems . . . has 90% less creep, 4½ times greater bending life!

SIMPLE TO SPLICE—Roebling Gas-Filled Cable actually is as easy to splice as ordinary paper power cable.

How? Because it virtually can "look after itself!" This remarkable cable is self-supervisory. Inside it, super-dry nitrogen gas is present at approximately 12 p.s.i. pressure. When pressure drops below 10 p.s.i.—or goes above 16 p.s.i.—a "trouble" message is relayed to the nearest attended station. Because you know *immediately* when something's up, repairs can be made before further, and perhaps more serious damage occurs! What's more, should small holes develop in the splices or elsewhere, escaping gas *prevents* the entrance of killing moisture until there's opportunity to repair the cable!

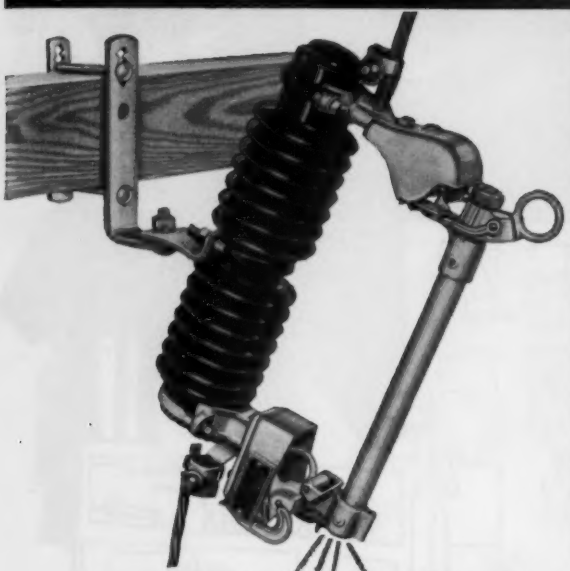
ROEBLING GAS-FILLED CABLE, for voltages up to 46 kv, offers other advantages, also. The inert dry nitrogen gas provides consistent dielectric properties throughout the cable's length. It prevents ionization, too. This Roebling Cable is as easy to splice as solid-type paper power cable —and if your system's profile includes grades, it will prove the most inexpensive cable you've ever specified!

Our new Gas-Filled Cable book soon will be ready. It tells you the fine points of this wonderful cable . . . and its applications. Write for it today! Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

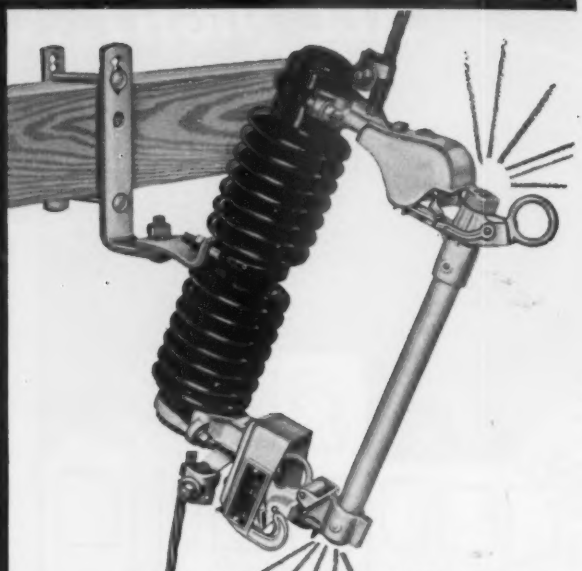
Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

What do you Need?....



...a *Single*-Vented Cutout for low fault interruptions?

or



...a *Double*-Vented Cutout for high fault interruptions?

You get Both with the Chance "F2"

Complete protection from High, Low or Medium Fault Currents

By using an expendable cap, the Chance "F2" Cutout single vents on low and medium faults, double vents on high faults for wide-range operation on low, medium or high fault currents. You get all the advantages of both single-venting and double-venting without the disadvantages of high fault stress on single-vented cutouts or the difficulties of low fault interruption with double-vented cutouts.

The top of the expendable cap, which seats against the fuselink buttonhead, is frangible, and tears out when pressure inside the fusetube approaches a value that might burst the tube. A mechanical link ejector makes doubly sure that the "F2" operates on low fault currents. This link ejector is vitally important to load break operation.

Here is a cutout to meet the needs of your present system and that will continue to protect your system of tomorrow. The Chance "F2" is available in 5.2, 7.8, 15 and 27 KV, and in 100 and 200 ampere ratings, with interrupting capacities as high as 12,000 amps. Advanced engineering features of the "F2" include: A positive latch, to prevent the cutout from coming open under vibration or shock . . . versatile, parallel-groove type terminals that give positive high-conductivity connections . . . and anti-corrosive bronze sleet hoods to completely protect the vital contact areas.

CK59-15

SPECIAL INTRODUCTORY OFFER!

Chance Link-Break Tool acts as a portable load break lever—makes any "F2" Cutout a load break cutout. You get a FREE Load-Break Tool with every order of 100 or more "F2" Cutouts. Offer expires October 31, 1959.

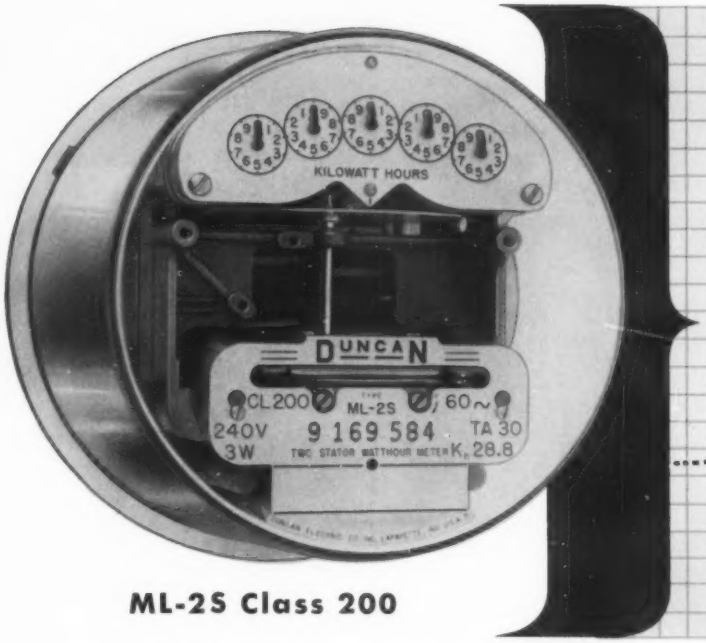
A. B. CHANCE COMPANY CENTRALIA MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

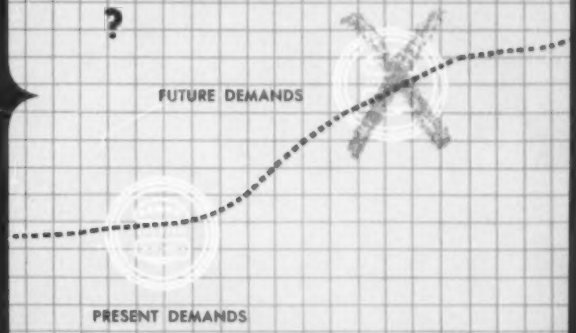
ABC INDUSTRIES

why pay twice

TO COVER FUTURE DEMANDS ?



ML-2S Class 200



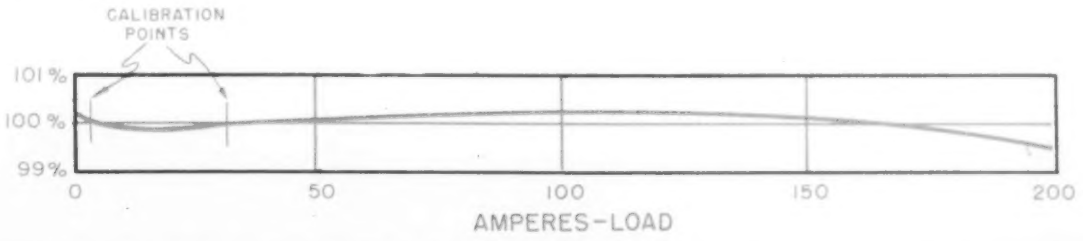
DUNCAN

200 AMP extended range polyphase meter

- **Accurately meters loads up to 200 amperes**
- **Reduces cost of replacement to meet increased demand**
- **Gives you more metering capacity per dollar**

DUNCAN Extended Range Meters can substantially reduce your metering costs. For example, the DUNCAN ML Class 200 Socket Type Polyphase meters accurately measure loads from a few watts to the meter's full 200 ampere capacity. Thus, it stays on the job long after increased demand has made it necessary to replace meters of lower capacity. You save both on installation time and on the cost of new meters . . . you get more metering capacity and longer metering service per dollar spent.

When you install DUNCAN meters you are assured of the finest performance that over 50 years of specialized meter experience can provide. One significant example is the long range load curve shown below.

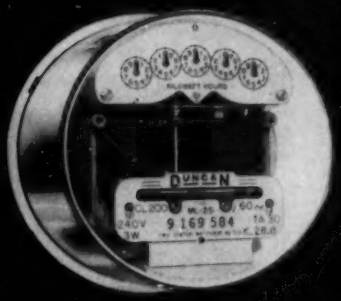


"Thinking Ahead . . . Moving Ahead . . . to stay Ahead of Demand!"

DUNCAN "COMPANIONS"

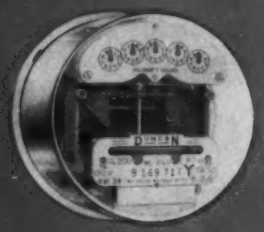
save space • save time • save money

EXTENDED RANGE POLYPHASE METERS



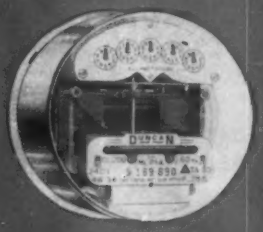
DUNCAN
ME-2S Class 200
3-Phase 3-Wire

ML - 2½S

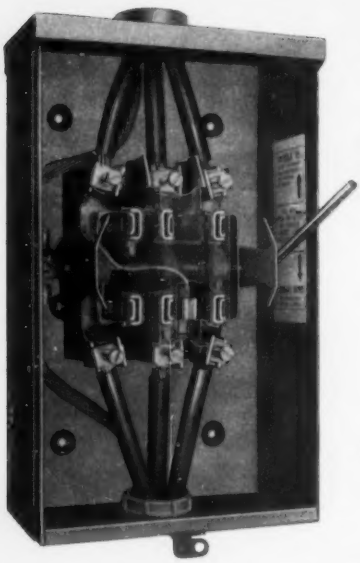


3-Phase 4-Wire Wye

ML - 2S△



3-Phase 4-Wire Delta



DUNCAN HQ | High Capacity-Quick Operating MOUNTING DEVICE

. . . featuring simultaneous by-passing and releasing of meter clamps

DUNCAN Type HQ mounting device (singlephase or polyphase) is conservatively rated for high load factor loads up to 200 amperes using self-contained socket type meters having a maximum capacity equal to the load to be served. DUNCAN HQ has many important construction and "use" features which add substantially to convenience and economy of installation.

← **TYPE HQ-7**

Used with 7-terminal meter on 3-phase 4-wire wye or delta services

TYPE HQ-5

Also Available May be used on 1, 2 or 3-phase 3-wire services

Write direct to Duncan Electric for descriptive data and bulletins on Duncan Extended Range Polyphase Meters and High Capacity Mounting Devices.

DUNCAN ELECTRIC COMPANY, INC., Lafayette, Indiana

LIVE BETTER ELECTRICALLY WITH FULL HOUSEPOWER

"THINKING AHEAD . . . MOVING AHEAD . . . TO STAY AHEAD OF DEMAND"

• Southwire Galvanized Steel Strand

STRAND SIZE	5/8"	1/2"	7/16"	3/8"	5/16"	9/32"	1/4"	3/16"
WEIGHT PER 1000'	813 lb.	517 lb.	399 lb.	273 lb.	205 lb.	164 lb.	121 lb.	72.9 lb.
MINIMUM BREAKING STRENGTH IN POUNDS								
ASTM A-122-54T								
Galvanized (Single Galv.) Common	11600	7400	5700	4250	3200		1900	1150
Class A (Double Galv.) Common	11600	7400	5700	4250	3200		1900	1150
Class A (Double Galv.) Siemens-Martin	19100	12100	9350	6950	5350	4250	3150	1900
Class A (Double Galv.) High Strength	29600	18800	14500	10800	8000	6400	4750	2850
Class A (Double Galv.) Extra High-Strength		26900	20800	15400	11200	8950	6650	3990
Class A Utilities Grade, A.T.&T. and Western Union Spec.—7-wires		25000	18000	11500	6000*	4600		2400**
ASTM A-363-55T (No welds)								
Weldless High-Strength		18800	14500	10800	8000			
Weldless Extra High Strength		26900	20800	15400	11200			

*weight per 1000'—225 lbs. **weight per 1000'—80.3 lbs.

The infinite patience and skill used by the seafarer in stranding or splicing rope is matched by modern machines at Southwire.

Southwire Galvanized Steel Strand is manufactured to meet or exceed applicable ASTM specifications . . . and preformed to eliminate flared ends when sheared. Quality is our first concern, including premium-quality non-returnable reels on all reel shipments. Available in 250', *500' and 1,000' coils, 2,500', *5,000', 5,280' reels. Feel free to inquire about special packaging to suit your particular requirements.

Specify Southwire Galvanized Steel Strand for ground, messenger and guying applications, *shipped by our own fast fleet of trucks direct to your warehouse or jobsite.*

*Stock items

Southwire Company

Carrollton, Georgia—TErrace 2-6311

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories
- NM Sheathed Cable

• ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

Use of aerial cable in modern

By L. C. Barry
Distribution Design Engineer
Southwestern Electric Power Co.
Shreveport, La.

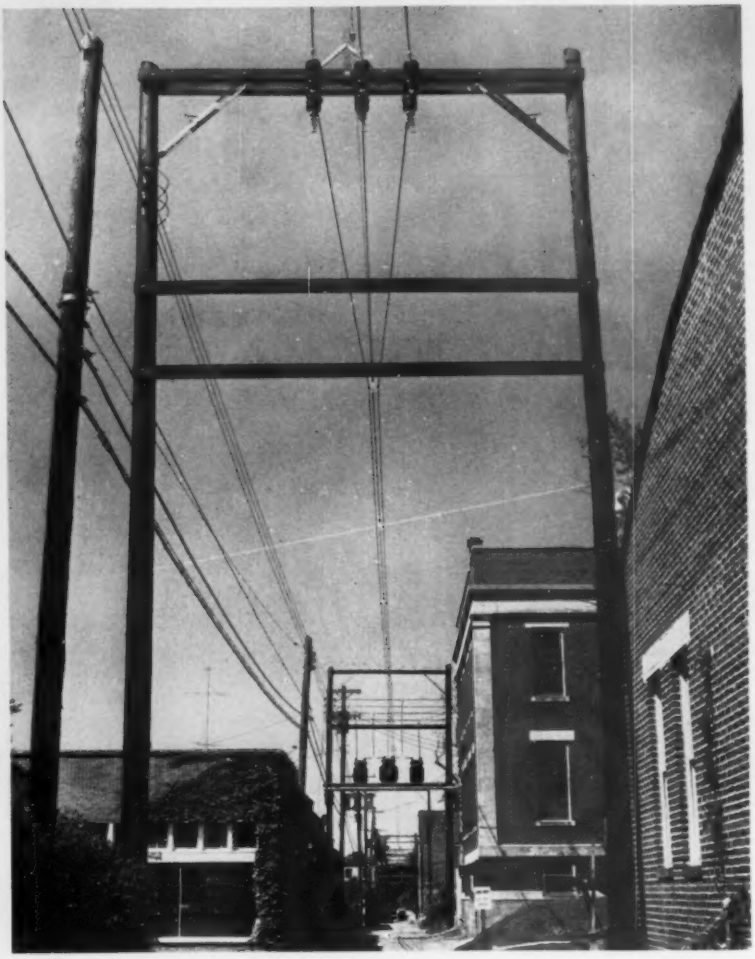
◆ A MORE EXTENSIVE use has been made of aerial cable in the past few years. This may be contributed to several factors including the ever increasing demands from the public and municipalities for improved appearence of overhead electric systems, and the recurring demands for underground systems, now in residential as well as commercial areas. Coupled to these demands are the desires of the electric utility to improve the appearance, to provide the utmost in safety, and to provide as high a reliable service as is economically possible.

The advantages of aerial cable are most fully realized when used for both primary and secondary on the same installation. The following two sections review one company's installation and operating experience on each of these applications.

Primary applications

Aerial cable has been used on the 12.5 kv distribution systems of the Southwestern Electric Power Company for some seven years and on the 4 kv system for twelve years. Principal applications on the 12.5 kv system have been in the business sections of medium size cities to obtain code clearances from buildings, provide greater safety to the public, increase reliability of service, and to improve the appearance of the distribution system. The installations were made at time of conversion from 2.4 kv. The cable systems feed overhead platform stations, underground vaults, and surface type vaults, depending on the location and requirements.

The preassembled type cable was determined to be the most economical as the installations varied widely geographically and were comparatively small, thus not making spinning equipment justifiable. The 15 kv cable has been rubber insulated, 19/64" thickness, shielded and with a 5/64" neoprene jacket and in various conductor sizes. Both potheads and outdoor terminations with rain shields were used. The cable manufacturers recommendations and instructions were followed in making splices and taps.



This photo shows use made of plexiglass spaced cable on H-frame fixture in Rogers, Ark. The work is not yet completed as the 2400 volt system is to be removed. A series street lighting circuit is to be replaced with a multiple system; a six-wire secondary will be replaced with four-wire covered aluminum; and open wire services will be replaced with cables.

Principal applications on the 4 kv system have been for use in heavy tree areas in high class residential areas. At this voltage a 5 kv non-shielded cable with 10/64" rubber insulation and 4/64" neoprene jacket is used.

Practically no trouble has been experienced with the 5 kv cable but serious trouble has occurred on some of the 15 kv cable installations. A lengthy interruption to a sizeable load in a business district certainly is deemed serious. Very little trouble has occurred with the outdoor terminations or potheads. The major failures have occurred in the splices and princi-

distribution systems

pally in the wye taps to transformer stations. These splice failures have been attributed to failure of the solder connections.

In the earlier applications an attempt was made to secure properly tapered compression connectors to use in lieu of the split tin solder type furnished in the splice kits by the manufacturers. Due to the small demand, the delivery time was long and this prevented their use.

With the use of compression connections and epoxy resin insulation for such taps and splices, the troubles experienced may be averted in the future. However, more development work needs to be done on a satisfactory means of making the epoxy resin applications.

A recent installation at 12.5 kv has been made of the new type cable system which utilizes a plexiglass spacer for the separation of the non-shielded insulated or covered conductor. This application was made in conversion of a 2.4 kv area to 12.5 kv and was utilized to maintain proper clearances from buildings and to give the utmost in appearance at a reasonable cost.

This type system is not a complete substitute for shielded aerial cable as it must be treated as open wire as far as clearances are concerned. It does, however, occupy a small space and satisfies the appearance requirement. In comparison to a shielded cable system, it does have several advantages including approximately 38% more current carrying capacity for equivalent conductor size. It is, of

(Continued on page 128)

Preassembled 15 kv aerial cable in one alley of business section in Longview, Texas.

These photos show secondary cable installations.

Service take-off at single phase transformers.

This view shows service from 3-phase, open wye bank.

A double deadend in secondary occurs at this pole.

Planning underground networks in small town business districts

By L. H. Scott
Distribution System Engineer
Florida Power Corp.
St. Petersburg, Fla.

◆ EXPANDING commercial areas of our small town (pop. 20,000) business districts and increasing load densities of the existing areas has led to the adoption of long range planning for progression toward underground networks in these towns.

The rapid saturation of commercial air conditioning in the past couple of years has, of course, accelerated an already steep rate of increase in electric load due to modernization of buildings and normal increase in usage, and it is expected that this trend will continue until 100% saturation is reached. These heavier load densities mean that customers not only need, but demand better service—and better appearance, too.

It is becoming more and more difficult and expensive to maintain and expand present overhead distribution facilities in these areas. Primary distribution voltage is 12 kv in most of these towns, or is scheduled as a part of our over-all plan to convert all distribution to 12 kv. Maintaining adequate safety code clearances is expected to become increasingly difficult as buildings expand. Sometimes the problem is a physical one of providing enough transformer capacity and locating poles in the places needed to serve the load. Transformer platforms will be out of the question in many of these places.

There is, of course, always the problem of working out these power distribution facilities to the satisfaction of city officials, property owners, and the general public. We are particularly conscious of our responsibility of being good citizens in the areas we serve and of creating desirable appearances and service reliabilities while still at the same time, maintaining as low cost electrical service as is possible.

It is becoming increasingly difficult to locate this type transformer installation in small-town business districts.

To meet these problems in an aggressive and modern manner, cognizant of our responsibilities, management has approved a gradual and systematically planned approach to underground distribution networks, to be accomplished in progressive steps commensurate

In working toward underground network systems in small town business districts, overhead transformer banks such as these are installed feeding into manholes from which services are run.

with the con.munity's load growth.

Having had considerable experience with underground distribution networks in our larger metropolitan areas for some time, we are very cognizant of the high initial expense involved in installing such systems when compared with the conventional open wire overhead system. This ratio, however, becomes less as load density and the degree of service continuity required increases. By preparing a flexible plan then, which will progress according to the load growth, we can provide the degree of service required, at the lowest possible cost, and planned in such a way as to meet tomorrow's load growths.

The business districts of two of our towns, in a division which has heretofore had little underground, have reached a point and are growing at a rate which has required setting up such a plan. Preliminary engineering was begun by analyzing existing loads and distribution facilities. A complete study was made to determine the availability of streets and alleys and the possible trend of future growth.

From this data, a preliminary plan was set up showing the area involved in the plan and proposed future vaults, manholes, and main conduit runs. Such a plan must, of course, be flexible, but its value was demonstrated almost immediately. When one of the main streets was rebuilt, it was possible to install conduit runs under the street much cheaper and with less public inconvenience than would have been possible later.

A step by step plan has been outlined toward accomplishment of the plan as follows:

1. Notify all electricians and customers within the designated area that this is considered a network service area and that service to all new or revamped loads should be at 120/208 volts wye and that each building should have only one service point, which will be designated by the company.

2. Secure necessary easements and rights-of-way in the area necessary to accomplish the plan. It is possible that problems involving rights-of-way could revise the plan.

3. Survey customers equipment to determine what allowances will have to be made when the circuit voltage is changed from 120/240 delta operation to 120/208 volts wye. This survey also helped to verify the load data determined from field tests. If necessary to secure satisfactory operation of 230 volt equipment, elements are replaced or small autotransformers are installed.

An additional survey is also made of metering installations before the conversion. As each section is changed to 120/208 volts

(Continued on page 128)

Spliced poles reduce cost of street lighting installation

By C. K. Jones
Overhead Planning Engineer
City Public Service Board
San Antonio, Texas

◆ INSTALLATION of street light fixtures on short Southwestern Bell Telephone poles was accomplished recently without the necessity of costly pole replacements. "Matching diameter size" short sections of poles are installed on top of the existing poles. Joined ends are sawed flat and spliced together with two 2" X 2" X ¼" galvanized angle irons three feet long.

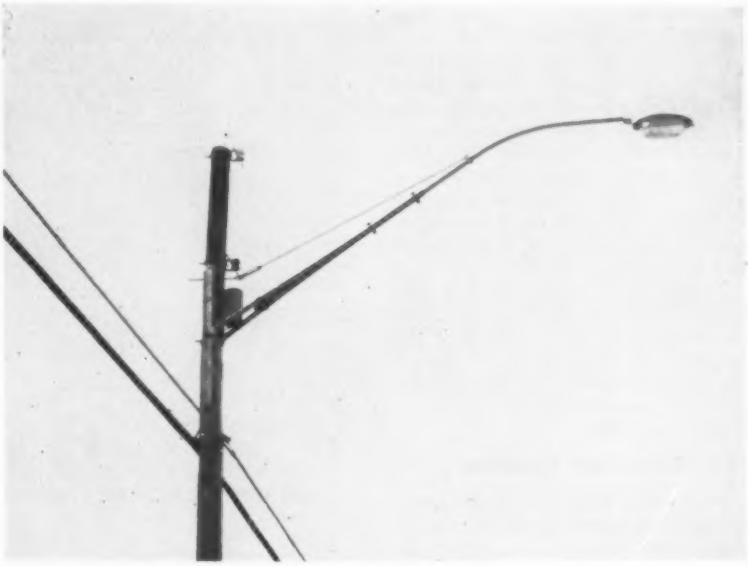
The splice is unnoticeable from the ground and is exceptionally strong. Tests were made of its strength by suspending a rope from the end of the mast arm near the lamp fixture, with two lineman swinging with their whole weight from it. No bending or permanent dis-location was obtained.

In most cases, the telephone poles are 30 feet in length, set five feet deep, leaving 25 feet above ground. Five foot lengths of pole are needed to obtain the desired 29 feet mounting height of light fixtures.

Published cost to the Telephone Company for replacing a 30 foot pole with a 35 foot pole is as follows: Assuming the 30′ pole is 10 years old, value of 30 foot pole removed prematurely (remaining life less salvage value plus removal cost) $35.99. The "in place" cost of 35 foot Class 5 pole is $51.00, making the total cost $86.99.

The cost to splice the "in place" pole is $8 for material and $4 for labor or a total of $12, resulting in a total saving of $74.99 per pole.

The accompanying illustration shows one of these installations. The pole top is also used to support the street light conductors.



Costs of street lighting installations have been reduced considerably through the pole splicing method illustrated here. It provides five feet additional height on existing poles 25 feet above ground.

Primary voltages of the future

By L. D. Cronin
Ebasco Services, Inc.
New York, N.Y.

◆ THE INTEREST in higher transmission voltages in the industry and the use of larger and larger generating units point up the effect of higher load levels on these portions of the over-all power supply system. It seems reasonable that distribution primary voltages should increase in the same manner to serve the larger distribution system loads. In this paper it is proposed to review in a general way the higher distribution primary voltages which may be needed now or should be developed to serve the load levels of the predictable future.

The impact of air conditioning on residential and commercial loads is an old story to the companies located in the South and Southwest. At the present time there is widespread interest throughout the electrical industry in electric space heating and in its effect on system demands and time of peaks. If it is used widely the impact of electric heating also may be tremendous in some of the companies in the southern area.

With the growing popularity of electric heating and cooling, there is every indication that utility system loads will continue to grow at a rate equal to or greater than that of the past. The development of other new uses and applications will continue so as to take advantage of the inherent convenience and economy of electricity.

Future usage and resultant distribution system loading may completely exceed the concepts of the present and there is every reason to look forward to distribution primary and secondary systems of greater capacity.

Historical evolution

In a discussion of distribution primary voltages of the future, it may seem strange to review the voltages of the past and their evolution through the years. In the evolution of the past, however, clues are often found which indicate logical developments for the future.

The accompanying table shows a listing in ascending order of some of the more commonly used transmission and distribution voltages which have been developed and their ratio to a common base (for convenience 115 volts). The tabulation is somewhat chronological in character as it begins with 2300 volts, which was used in the early days of the industry, and ends with 345,000 volts, which is the highest transmission voltage yet constructed in this country. Fundamental ratios are included to facilitate comparison of transformation ratios between the voltages listed.

In the early development of the electrical industry, 2300 volts came into general use to distribute electricity with the load levels of that time and within the distances considered practicable. With the passage of time and increase in load, some companies elected to increase the capability of the 2300 volt (20 to 1 fundamental ratio) system by doubling and tripling this voltage and using 4600 and 6900 volt levels. Each of these systems was converted to wye operation in

TABLE I

TRANSMISSION AND DISTRIBUTION VOLTAGE RELATIONSHIPS

Subtransmission and Transmission Voltages (Kv)	Distribution Primary Voltages (Kv)	Fundamental Ratio - 115 Volt Base
-	2.3/4.0	20/34.5
-	4.6/8.0	40/69
-	6.9/12.0	60/104
11.5 ——→	11.5	100
13.2 ——→	7.62/13.2	(Not Related)
23 — — —→	13.2/23	115/200
34.5 - - - - - - - - - - →	20/34.5	173/300
46 - - - - - - - - - - →	26.5/46	230/400
69	-	600
92	-	800
115	-	1000
138	-	1200
161	-	1400
230	-	2000
287.5	-	2500
345	-	3000

Transition from Subtransmission to Distribution

——————— Completed in many companies

_____ _____ _____ Increasing

— — — — — — — — — Future Consideration

many instances to increase the system capability and still use the same distribution transformers.

Another early development used extensively was the retention of the 2300/4000 volt system in urban areas and the introduction of 11,500 or 13,200 volts as subtransmission with step-down substations to 2300/4000 volts. Many of the 11,500 and 13,200 volt systems were supplied directly from generator buses as 13,200 volts was probably considered the highest practical level for generator windings at that time.

As demands continued to increase, the 11,500 and 13,200 volt systems were served from higher voltage transmission systems in many cases. During the same period loads were gradually connected to the 11,500 and 13,200 volt subtransmission systems and the over-all economy of using these levels as distribution primary voltages with step down directly to secondary utilization voltage came to be realized.

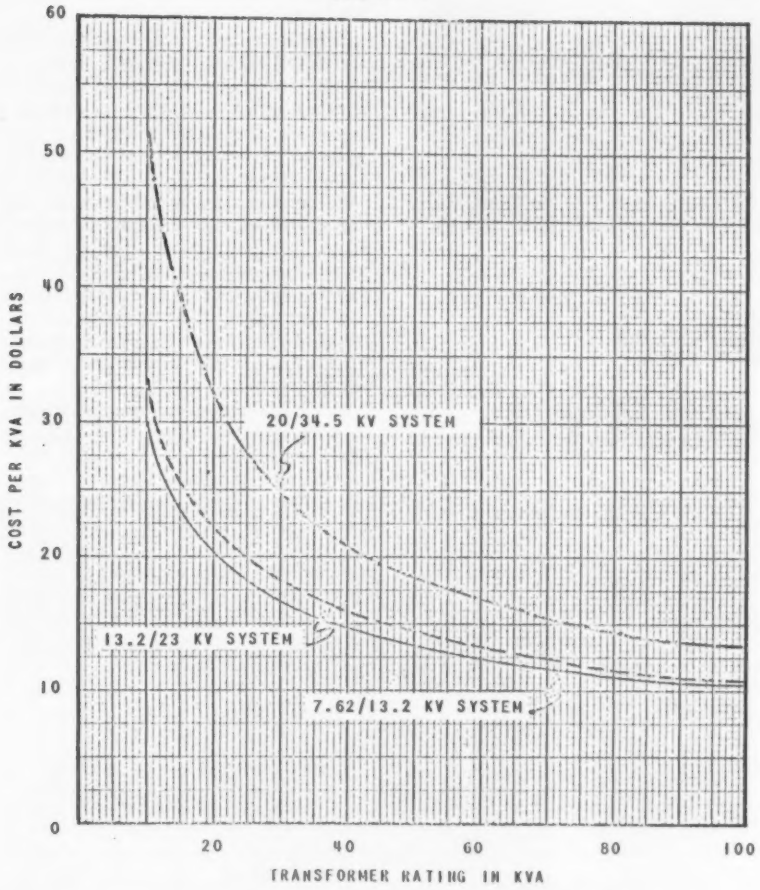
Use of these higher distribution voltages allowed the elimination of the expensive transformation from 11,500 to 13,200 volts to 2300/4000 volts, and freed the distribution system from the limitations of the lower voltages. This elimination of a transformation set a pattern for future distribution system development.

The popularity of the 13,200 volt level was indicated by the development of a transformer for line-to-neutral connection with a 7,620 volt rating. This rating (which was used only with 120 volt base) was derived by dividing 13,200 volts by the square root of three and has an odd line-to-neutral ratio to 120 volts (63.5 to 1). In contrast, previously developed distribution systems had an even transformation ratio on a line-to-neutral basis (20 to 1, 40 to 1, and 60 to 1).

As indicated by the arrows in the table, the pattern of change-over from subtransmission to distribution of voltages in the 11,500 to 13,200 volt range is now an accomplished fact. Many companies have eliminated entirely the use of transformations from these voltages to the 2300/4000 volt level.

In the use of these systems (using 13,200 volts as an example) the inherent economic ability has usually been realized by serving a relatively large area and connecting the source substations to transmission systems rated 69 kv and higher. This allowed the "freesing," i.e., use of present facilities without future additions, of subtransmission systems of 46 kv and below and the elimination of a transformation from these subtransmission systems to 13,200 volts. Thus, one of the major economical advantages of the use of 13,200 volt distribution has been the elimination of one or more transformations in the over-all power supply system.

CHART I



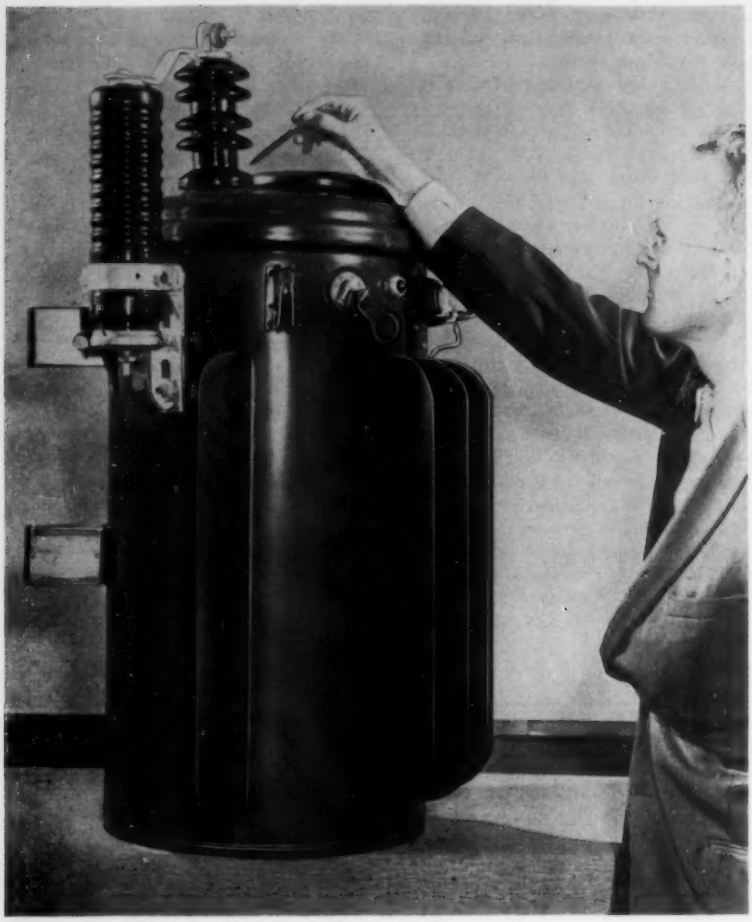
INSTALLED COST - CONVENTIONAL TRANSFORMER INSTALLATION WITH LIGHTNING ARRESTER AND CUTOUT

Higher primary voltages

If the pattern of past development of the 13.2 kv system is a sound one, future higher distribution voltages should be initiated by conversion of existing subtransmission systems to distribution operation and the elimination of one or more transformations in the over-all supply system. The next logical step is the 13.2/23 kv level for companies which have 23 kv subtransmission systems. Some of the companies in the Southeastern area have already initiated 23 kv distribution and the use of this system is expanding rapidly both in this area and elsewhere.

If the same historical pattern is followed, the next higher distribution primary voltage should be 20/34.5 kv and this level should be attractive to companies which now have 34.5 kv subtransmission. Distribution engineers are now seriously considering the economy of this voltage and one western company has over ten years operating experience with it. One of the equipment manufacturers has made available a full line of distribution equipment for the 20/34.5 kv system, including transformers, capacitors, cutouts, lightning arresters and reclosers. This manufacturer deserves a great deal of credit for his forward thinking in

(Continued on page 125)



Features of this new distribution transformer line include new insulation which resists aging and embrittlement; cover mounted bushings designed so internal fuse can be replaced without removing the bushing; and plastic coating for cover which reduces accidental shorting by birds and squirrels as well as corrosion.

Distribution transformer has 20% more loadability

◆ A NEW INSULATION system called Permalex (Trademark of General Electric Co.) will permit peak loads to be increased an additional 20 per cent of transformer rating with no sacrifice in life expectancy for a new line of pole-type distribution transformers introduced by the General Electric Company. Ratings will be available up through 167 kva.

Besides making operating cost reductions possible through greater loadability than ever before, the transformers will require less maintenance than present designs with a new plastic coating that insulates the transformer covers from accidental shorting by birds and squirrels and reduces other service outages and corrosion.

Other features introduced by the company's Distribution Transformer Department for its new 1959 pole-type model are higher light and breaker settings for self-protected units, improved cover-mounted bushings designed so the internal fuse can be replaced without removing the bushing, and a rolled-under base (on ratings through 100 kva) which will minimize damage from scraping.

Permalex insulation

Load increases up to 20 per cent in the range of about 130-170 per cent peak load are possible with no sacrifice in life with the patented insulation system. If operated at the same loads as present transformers, life expectancy of the new transformer design would be five times that of currently available designs, according to company engineers.

Heart of the new insulation is a paper made from kraft pulp which has been chemically treated to retard thermal degradation—the aging and embrittlement of cellulose fibers under prolonged heating.

Developed in the company's Pittsfield, Mass., research laboratories, the paper is made from a kraft pulp whose basic chemical structure has been altered in the pulp stage by a process known as "cyanoethylation." Cyanoethylation replaces some OH groups in the cellulose structure with cyanoethyl groups. This raises the paper's thermal endurance and retards water formation. The result is a new paper that permits a significant increase in transformer loading and life expectancy, the engineers said.

In "sealed-system" tests at 150 C, Permalex treated kraft paper prolonged dielectric strength retention and retained almost 80 per cent of its original tensile strength after 3500 hours. Other untreated materials, according to the engineers, weakened to 30 per cent or less after the same period of time.

Completely compatible with all materials in the new transformer, the cyanoethylated paper has no detrimental effect on such things as enamel film insulation, steel or aluminum parts, or oil.

Light and breaker settings

New light and breaker settings have been designed for self-protected models of the new transformer line to take advantage of the greater loadability. Trip values are based on expected load factors and permissible overload-

(Continued on page 127)

Modernizing lighting for outdoor substations

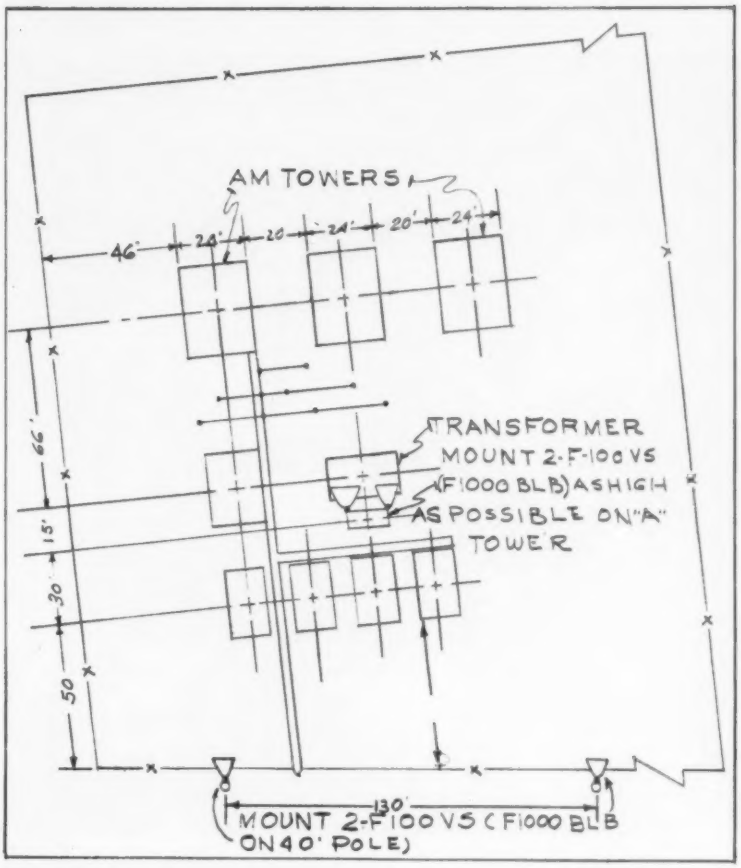
By Bennie H. Bell, Jr.

Associate Engineer
Louisiana Power & Light Co.
Gretna, La.

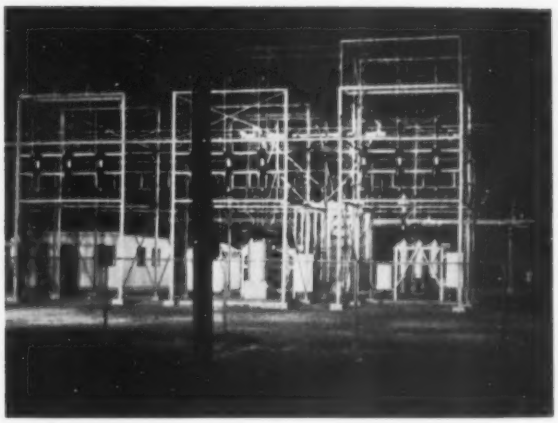
◆ MANY ELECTRIC utility substations are still being lighted by standards which were developed about 1925. These standards specified numerous incandescent units in strategic locations about the substation. The old type incandescent fixtures had glass lenses for the symmetrical distribution of down light. Frequent bulb replacements made the maintenance cost of these fixtures high, and the substations did not present an "Adequate Lighting Job" to the public.

Realizing the disadvantages of the above system, Louisiana Power & Light Company engineers investigated many types of light sources: incandescent, fluorescent, and mercury vapor. Mercury vapor was chosen because it produced a desirable kind of light and had long bulb life. When this type of light source was selected, it was then necessary to find the proper fixture. A reflector with the lamp mounted vertically, which produced a wide angle of reflection on the horizontal plane, and a narrow angle of reflection on the vertical plane was decided upon as the most desirable.

(Continued on page 125)



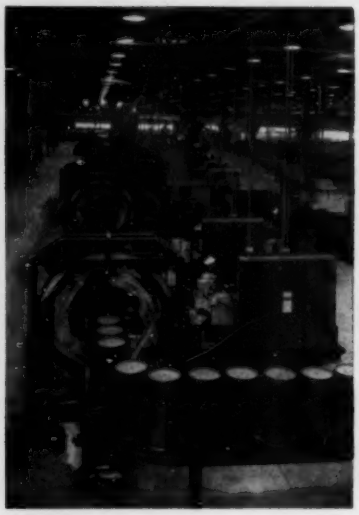
Lighting design for substation of Louisiana Power and Light Co. making use of four 2-F-100 VS units with 1000-watt mercury vapor bulbs. The lighting is controlled automatically by a photocell device.



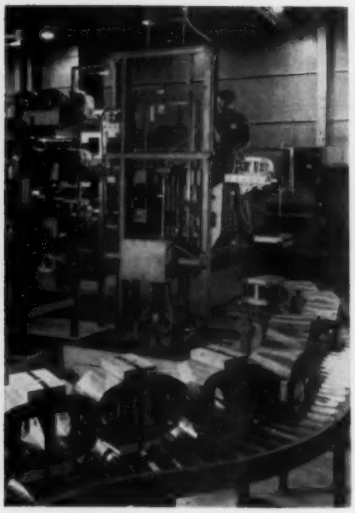
The difference between old fashioned illumination for substations and a modern well designed job utilizing high mounted mercury vapor units is emphasized in these "before" and "after" photos.

Georgia's

Core production line. In foreground, rolls of core steel are slit to proper widths. Beyond, winding machines; left, annealing furnace.



Tanks near end of production line.



Completed coils go into storage.

◆ TURNING OUT distribution transformers at the rate of one every two minutes is accomplished easily at the highly automated transformer plant of Westinghouse Electric Corp., in Athens, Ga.

Editors of electrical and industrial publications were special guests at the Athens plant recently to view first hand how the use of highly mechanized production and materials-handling equipment and modern quality control techniques makes possible the economic, efficient production of high-quality, uniform transformers.

To minimize materials handling, the plant uses almost five miles of material-handling equipment of various kinds. These include in-floor tow lines, overhead monoveyors, power-and-free conveyors, and many special racks, trucks, and transfer devices.

While the new plant was still in the planning stage, design and manufacturing engineers working together accomplished a major redesign of the transformer core and coil. In addition to simplifying manufacturing problems, the new core and coil has improved performance characteristics.

The entire plant is laid out for straight-through flow of materials from receiving to shipping floor.

The receiving floor is arranged so that all materials used in each feeder section are stored at the head of this section. Incoming material proceeds in a straight-through flow from the incoming carrier through the receiving floor and into and through the manufacturing feeder section and on to other feeders or to final assembly.

Flow through the three major feeder areas—tank and core fabrication, and coil manufacture—results in finished tanks, cores, and coils. Then using a unique power-and-free overhead conveyor system, these components are transported in the proper sequence and timing into a humidity-controlled room for final assembly operations, including core-coil assembly, tanking, evacuating and oil filling, and the finished transformer moved to tests, final paint touch-up, and crating.

As a result of continually ex-

automated transformer plant

panding requirements of the electric utility industry for pole-type transformers, the new plant was built to supplement production at the company's two other distribution transformer plants: one at Sharon, Pa.; the other at Sunnyvale, California.

The new plant was located at Athens for several reasons: assurance of better and faster service to important customers in the southeastern states; availability of a good labor market; desirable social and cultural environment; and other economic considerations.

Discussing operations at the Athens plant, Gordon C. Hurlbert, manager of the company's distribution and instrument transformer department, said, "This is one of the largest Westinghouse facilities in the entire South, and is certainly the most modern of its kind in the electrical industry."

The single-story plant has more than 560,000 square feet of manufacturing area. A two-story attached office building has an additional 58,500 square feet. The plant is located on a 240-acre tract just north of the Athens city limits.

Automated testing

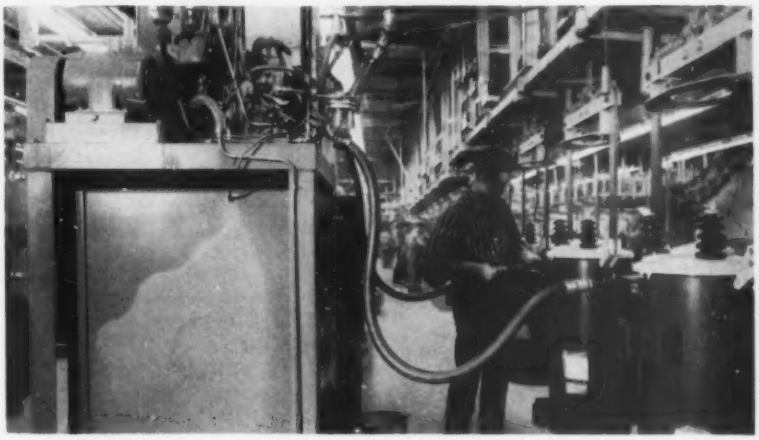
Of particular interest to this writer was the "carousel" test line which is typical, perhaps, of the degree of automation incorporated in this modern plant which accepts copper in bull rods, tank and core steel in huge rolls, and turns out a complex piece of electrical equipment—all with practically no lifting, pushing, or rolling on the part of the skilled workmen who man the production lines.

The carousel test line is a unique facility that automatically electrically inspects the distribution transformers after final assembly. The test line performs a series of nine standard commercial tests on a transformer, evaluates and records the results of these tests, and accepts or rejects the transformer.

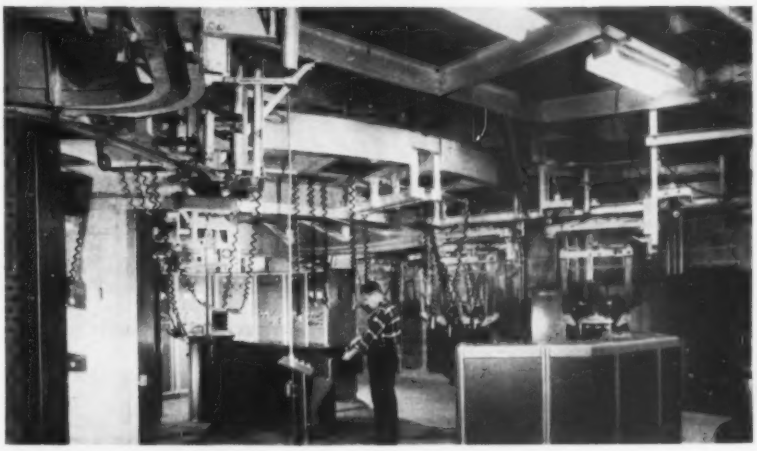
The operator need only attach test leads to each transformer as it enters the carousel line. Tests are then programmed automatically from punched cards, one card being required for each transformer. When a transformer

(Continued on page 124)

High and low voltage coils are wound successively on a single mandrel.



Transformers are evacuated and filled with oil; proceed to test line.



Automated "carousel" test line: nine standard tests made in 90 seconds.

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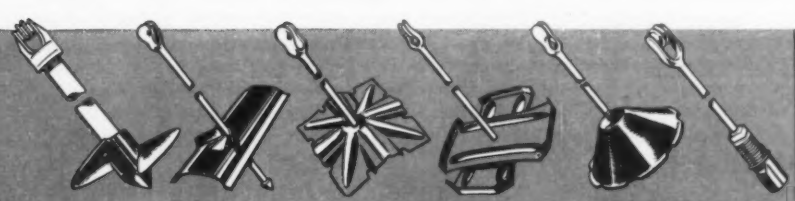
This line crew bores a hole for the pole, then fastens an adapter and screw anchor on the end of the bit. Screw anchor is installed without removing auger or bit.

CHANCE SCREW ANCHORS for speedy, cost-cutting machine installation

CA59-6

More and more utilities are cutting screw anchor installation time to the minimum by installing Chance Screw Anchors with their hole boring equipment. They use the Chance "Blackfoot" Screw Anchor because it is designed with fast-cutting, "pitch controlled" blades that can screw down rapidly with little earth disturbance. And, the King-size Thimbleye on these anchors easily fits the boring machine adapter. Chance Screw Anchors come in a range of sizes from 4" to 15" in diameter. You can get them from stock in most areas.

Send for your copies of "ANCHORING," the most complete guide to proper anchoring ever developed. It shows you how to choose the right anchor for every condition — and how to install it properly.



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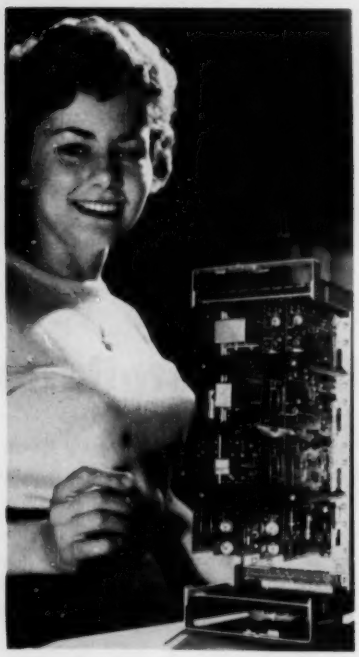
Relays without moving parts

General Electric unveils phase comparison relay

◆ A NEW STATIC protective relay capable of operating at speeds faster than conventional electro-mechanical designs was unveiled recently by General Electric's Low Voltage Switchgear Department.

Development of the new static phase comparison relay—first in General Electric's new line of static relays for wide application in the protection of high voltage transmission lines and power system components—opens a new era in the art of protective relaying, according to department general manager Frank E. Stehlik.

Believed to be the most significant advancement in protective relaying since the introduction of high-speed relays thirty years ago, the new transistorized design has completed exhaustive field tests on the Muskingum-Philo 138 kv line of The Ohio Power Company.



Cathy Desmond, of GE's Low-Voltage Switchgear Dept., holds a tiny transistor beside the company's new static phase comparison relay.

Operating within one and one-half cycles, the new static relay greatly reduces damage caused by line faults and improves stability to give better system protection.

Designed for use with General Electric's new transistorized carrier current equipment, the relay provides high-speed simultaneous tripping of transmission line breakers for all internal faults by comparing phase relationships of currents entering and leaving a line section.

The transistorized units can be widely applied in the protection of high voltage transmission lines.

Design flexibility permits use of the relay on multi-terminal transmission lines. Addition of new terminals to existing lines is possible without major changes to the relaying system. Because of its high sensitivity, the new static protective relay detects lower magnitude faults and permits heavier line loading with an equivalent protection level.

Incorporating static components, transistors, stabistors, diodes, and reference diodes, the static phase comparison relay eliminates the necessity of tubes, and their related maintenance costs.

All transistor circuits are equipped with positive temperature stabilization to give consistent performance over a wide range of temperatures.

A "plug-in" modular construction facilitates testing and maintenance.

Phase comparison relay

Phase comparison carrier relaying provides high speed protection of important transmission lines against all faults by comparing the phase position of currents entering and leaving the transmission line section. The complement of equipment required at each terminal of the line consists of the phase comparison relays and the carrier current transmitter and receiver with its associated coupling capacitor and line trap.

The carrier equipment serves as a communication channel between the two relaying equipments. The relays accomplish several functions. They detect and measure the fault. They key the local transmitter with fault information and, they compare local fault information with remote fault information in order to determine whether or not the power circuit breaker should be tripped.

The relaying equipment functions somewhat in this manner: The three-line currents are fed to a converter function. It is its purpose to convert the three-line currents into a single quantity which can be more easily used for comparing and carrier keying purposes. (The converter function is accomplished by means of a negative-phase-sequence current segregating filter.)

The output of the converter passes to the fault detector function and the squaring amplifier function. It is the purpose of the fault detectors to determine whether or not a fault exists and in turn provide a supervising function to both the comparer unit and the squaring amplifier.

The squaring amplifier has two functions. First, it must raise the energy level of the signal from the converter to a point where carrier can be keyed; and second, it must change the sinusoidal signal from the converter into a squared block type output. The squared signal from the squaring amplifier is passed on to the comparer function as well as the carrier-current transmitter.

The comparer function receives, in addition to the supervisory signal from the fault detectors and the signal from the squaring amplifier, a third signal which comes from the carrier-current receiver and which in form is squared on a half-cycle basis similar to that signal passing from the

(Continued on page 123)

There are CHANCE ANCHORS for all soil and guying conditions.
A. B. CHANCE CO., Ltd. of Canada

utilize semi-conductor units

Allis-Chalmers unit suited to industrial switchgear

◆ A STATIC protective relay for industrial switchgear application, and plans for manufacturing a line of transistorized relays at the West Allis (Wis.) plant, has been announced by Allis-Chalmers Mfg. Co. The new relay is the first major departure from the mechanical induction disc design introduced approximately 50 years ago.

Basic circuitry incorporates various types of semi-conductors now available from the electronic industry. Moving parts and the problems associated with them have been eliminated. Extensive temperature range and life tests have proved the high reliability of the static relay.

Size greatly reduced

The static relay is ⅓ the size of its predecessors. Three single-phase units fit present switchgear and switchboard panel cutouts designed for one single-phase induction type. Calibrations and settings are adjusted with three sets of external controls located at the front of each unit.

All relay components are mounted on a printed circuit board. A metal frame secures the board and an epoxy potting compound makes the relay shockproof and impervious to moisture. Relays have been temperature stabilized.

Installation or removal is simplified by a plug arrangement. The usual current transformer shorting switches are not required and therefore omitted.

Neon indicating lights for instantaneous and time trip indications replace the mechanical target indicators. With the neon indicator, false target readings are eliminated.

Since there are no moving parts, there is no inertia to overcome in operation. This feature enables the new relay to adjust itself instantaneously to the prevailing load distribution. The resetting speed can be controlled in case such special control is required.

Relatively short resetting time is a distinct advantage in all cases where shifting loads in an electrical distribution system require close setting of relays. It functions without overshooting and will respond instantly to a change in current.

The static relay is less sensitive to frequency variation. This means that during system disturbances where the frequency varies, the static relays will maintain proper coordination.

In combination with existing induction relays, A-C's static device minimizes coordination problems. It performs without undesirable acceleration and deceleration, resets itself instantaneously, takes somewhat longer to operate on decreasing currents, and acts somewhat more quickly on increasing currents.

Because of lack of inertia, coordination between several static relays is greatly simplified.

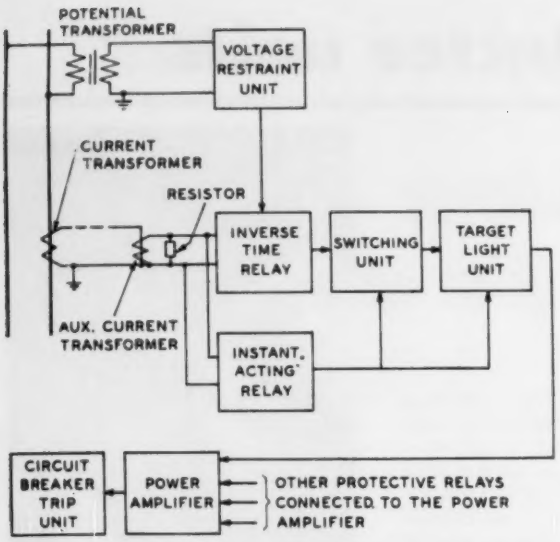
The new overcurrent relay will be available in limited quantities this summer with A-C switchgear equipment as production facilities are completed. Additional relay types will be introduced as rapidly as development designs can be adapted for production.

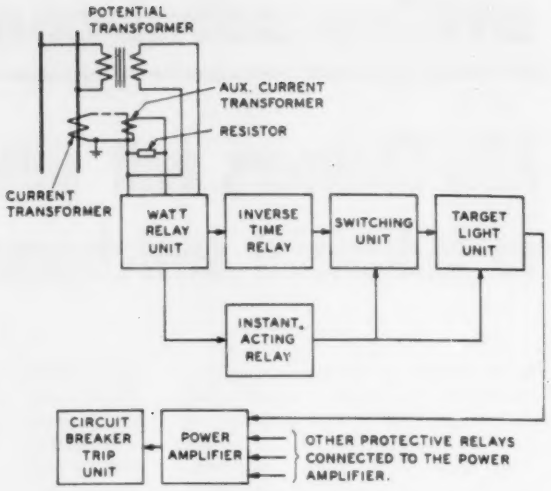
How the relay works

Based on a complete revaluation of protective relaying practices, the new Allis-Chalmers static over-current relay unit for switchgear can be modified very easily for specific applications. The building blocks comprising the basic relay are shown in the accompanying diagram.

Since the power required to operate the new relay is less than one-half volt-ampere, the relay may be operated by using small auxiliary CT's. The relay may also

Printed circuits and semi-conductors feature the new Allis-Chalmers static relays for which a high degree of reliability is predicted. Switchboard mounting of three of the new units, shown below, gives comparison with three conventional induction overcurrent relays.





Various elements of the new static relay system are illustrated in these block diagrams. The diagram at the left, minus the voltage restraint unit, represents the basic inverse time overcurrent relay which is connected in series with a pulsing type switching unit. The basic unit may be controlled, as shown, by the addition of a voltage restraint unit. Also, as shown at right, the restraining unit can be designed to respond to power, or if desired to current, phase angle, pressure, light quantities, etc.

be connected directly across the secondary winding of the main current transformer, which is shunted by a resistor.

The inverse-time-current relay unit is connected in series with a pulsing-type switching unit. This unit is designed to use relatively low input power and functions as an amplifier.

The basic unit may be controlled by addition of a voltage restraint unit, and the restraining unit can also be designed to respond to current, power, phase angle, or may consist of a transducer to translate pressure, light quantities, etc., into discrete electrical quantities.

By addition of a control unit responsive to electrical quantities (example, power) the relay is then responsive to power as derived from suitably connected current and potential transformers.

The flexibility of the static relay opens the way to many special applications. For example, one type of static relay can be equipped with an integrating double-acting memory device to simulate heating and cooling of an electrical device such as a motor. The advantage of such a relay to the user is the capability of operating in close proximity to temperature limitations, without causing unnecessary outages.

Although relays have been devised that react to both heating and cooling of electrical apparatus, they must be supplemented with fast-acting relay devices to guard equipment during instantaneous fault conditions. This type of static relay combines within *one device* characteristics that simulate to a predetermined degree the heating as well as the cooling of a specific electrical device, and will still function with sufficient speed in case an extremely high overcurrent should result from insulation failure. Thus, flexibility is available to the user to attain both close coordination with electrical apparatus and high speed fault protection.

Other advantages

The induction type relay is known to be shock sensitive. Major adjustments after shipping and installation can rarely be avoided. In contrast, the static relay is shockproof. All relay component parts are mounted on a printed circuit board which is inserted into a metal frame; the frame is then filled with epoxy-resin. The relay is then impervious to moisture as well as being shockproof.

The effect of temperature variations is minimized. Risk of damage due to improper handling is all but eliminated. The user need not concern himself with moisture or dust conditions and very rarely with temperature.

The power required to operate induction relays calls for sizeable current transformers located on the switchgear bus. The static relay requires less than one-half volt-ampere, which can be supplied by a small auxiliary current transformer.

A common problem encountered in protective relaying is to determine which phase was faulted after shutdown. The mechanical latch-type "target" indicators have been known to give false indications because they can be triggered by vibration.

This problem has been solved with a completely static type target light unit consisting of neon lights on the relay itself. The neon lights are operated by electronic memory cores, and can be arranged to operate a remotely located annunciator. This is an example of "memory" elements used to increase the reliability of operation which means peace of mind for the user.

Proper coordination of induction relays has been difficult in the past due to the inertia of moving parts. The new static relay can immediately be coordinated with induction type relays or other static relays.

If a given overcurrent condition improves, the relay will sense this and react to delay tripping up to 15 per cent of the total time delay

(Continued on page 124)

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Parallel operation of regulators

By Dwight Kortman
Regulator Dept.
Allis-Chalmers Mfg. Co.

This is the sixth of a series of articles on the subject of voltage regulators. This article continues the discussion of requirements for paralleling regulators and presents several specific schemes for parallel operation.

Paralleling by negative reactance

If total loop impedance is 20 per cent or greater, the negative reactance type of paralleling might be used (Fig. 9). This would usually mean that the two regulators are connected through several miles of line in addition to having their respective transformers in the loop circuit. The main advantage of this method is that there are no interconnections required between the two regulators so they can be a considerable distance apart.

The reactance element of the line drop compensators of both regulators is reversed. Since the circulating current is primarily reactive, should unit 1 be on a higher tap position than unit 2, the circulating current will flow from 1 to 2. It also shows up in the line drop compensator, which means that a greater current flows through the reactance element of unit 1. The regulator will lower its voltage since the reactance element is reversed. Unit 2 will raise its voltage until the circulating current has been reduced sufficiently.

This method can be used to parallel any number of units, but it has a major disadvantage in that load current will also affect the negative reactance element. As the load increases, the regulators will tend to lower their voltages. Increasing the amount of resistance compensation that is set into each regulator offsets this condition.

Paralleling by cross-connected CT's

Should loop impedance be 15 per cent or greater, the cross-connected current transformer method of paralleling could be used, if the two regulators are located together. It would mean running interconnecting leads between the two regulators (Fig. 10). The primary of the current transformer of regulator 1 is fed into the control panel of regulator 2, and likewise the primary of the current transformer in 2 is fed into the control panel of 1.

With compensation cut into both control panels, compensating current for 1 comes from the current that flows in 2, and vice versa. When the currents flowing in both regulators are equal, each unit receives the same compensation, and a stable condition exists. However, if regulator 1 should carry more current (total of load and circulating) than 2, this would cause the second regulator to start raising its voltage and the first to start lowering its voltage. This will continue until a stable condition is reached.

The main advantage of this paralleling scheme is similar to the one previously mentioned in that no additional or auxiliary equipment is required. The major disadvantage is that only two units can be paralleled. Sensitivity of the paralleling scheme depends upon both the band width setting of the voltage regulating relay, and also the amount of reactance compensation in the line drop compensator.

Another disadvantage of this method is that the amount of re-

Analysis of regulator paralleling methods

Type of paralleling method	Minimum amount of loop "Z" required	Advantages	Disadvantages
Negative reactance	20%	1. No interconnections between units 2. Units can be located a considerable distance apart 3. Can parallel more than two units	1. Load current can adversely affect negative reactance element and output voltage of regulation
Cross-connected	15%	1. No auxiliary equipment required	1. Only two units can be paralleled 2. Amount of reactance compensation required to limit Ic may result in overcompensation 3. Units are interconnected
Current balance	12%	1. Any number of units can be paralleled 2. Can be applied to any standard regulator	1. Interconnecting leads must be run between regulators
Electrical interlock	Dependent on the particular application	1. Units can be kept on same step or specified number of steps apart	1. More complicated and time consuming to install

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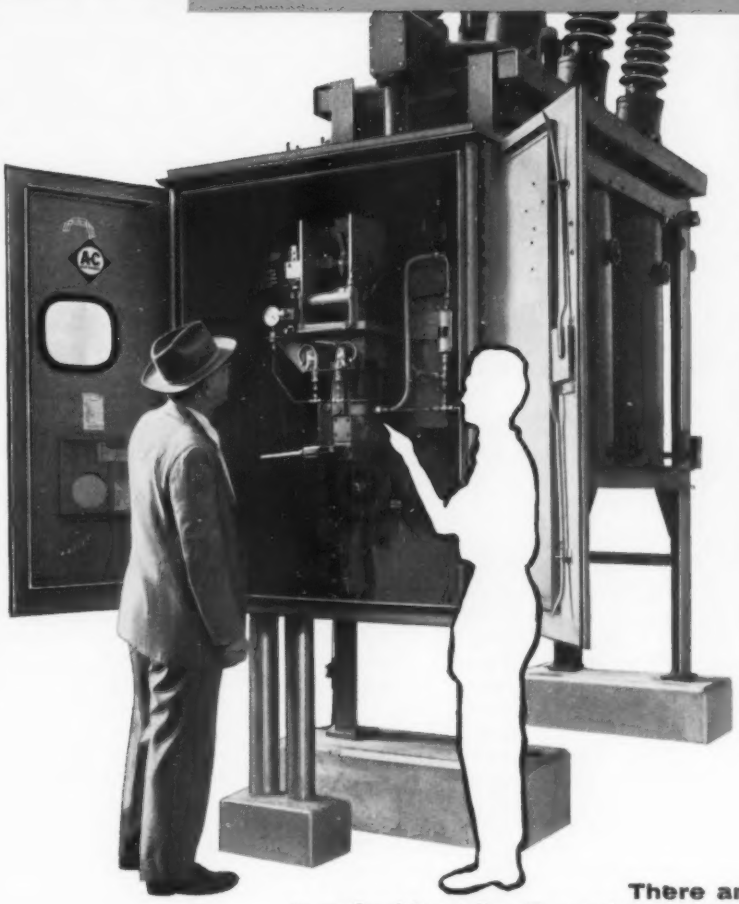
Look at the NUTS and BOLTS



There are no short cuts to modernizing today. Few systems are so completely outmoded that the steps needed to modernize them are completely obvious.

However, as equipment manufacturers, we at Allis-Chalmers see several areas which offer considerable potential for improvement among a wide group of utilities. One of these is what we call "Looking at the nuts and bolts."

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On the following pages are items of Allis-Chalmers equipment we recommend for the design "extras" that can help your company stay modern.

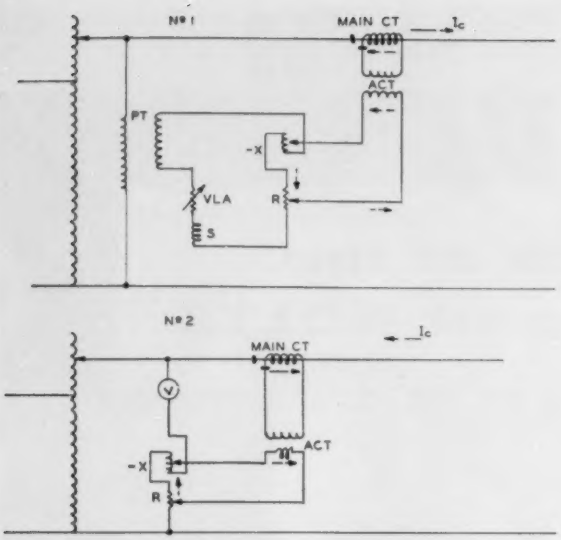

Fig. 9 (Left)—Arrangement for paralleling regulators utilizing negative reactance. For simplification, the control circuit shown above for Reg. No. 1 will be drawn as shown above for Reg. No. 2. This simplification will be followed in Figs. 10 to 12. The meaning of the symbols are as follows: PT - potential transformer; ACT - auxiliary current transformer; VLA - voltage level adjustment: S - voltage regulating relay solenoid; R - resistance compensation; —X - negative reactance compensation; V - voltage level adjustment plus solenoid.

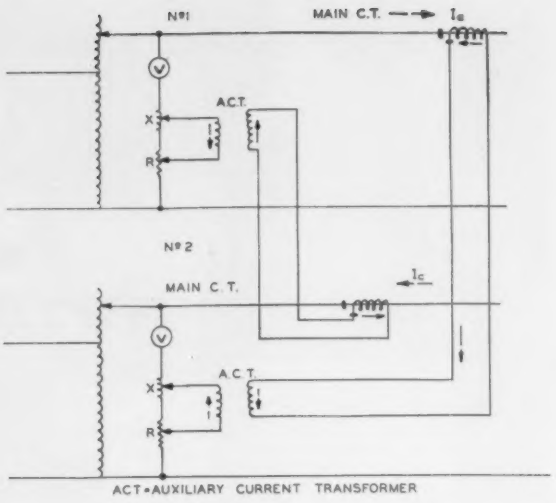

Fig. 10 (Right)—Example of connections for paralleling two regulators by means of cross-connects CT's. See Fig. 9 for explanation of symbols.

actance compensation required may be so great that the machine would be overcompensated, and its output voltage would be too high.

Paralleling by current balance

The most popular type of paralleling scheme today is current balance. Both load current and circulating current are recognized as individual quantities and cause the controls of each regulator to act accordingly. Fig. 11 shows two units paralleled by the current balance method.

Each is supplied with a current balance paralleling unit, consisting of a paralleling reactor, a paralleling blocking transformer, and a paralleling equalizing transformer. These three small transformers are connected into the control circuit of each regulator, and then interconnections run between the two units.

The diagram shows two regulators in parallel with a portion of the current balance paralleling equipment. It is assumed that regulator 1 is at a higher tap position than regulator 2. Therefore, the circulating current as shown by the dashed arrows is flowing from 1 to 2. It is further assumed that each regulator is carrying equal components of load current as shown by the solid arrows.

Connected into the control circuit of each regulator is the paralleling reactor and also the blocking current transformer. The secondaries of the blocking current transformers are connected in series. Therefore, the control circuits of both regulators must carry equal components of load current, so that both regulators carry equal components of load current.

Circulating current is separated from the load current by means of the paralleling reactor. The circulating current would flow through the paralleling reactor of regulator 1 in a direction that would cause a voltage rise within the control circuit, and 1 would start to reduce its voltage. Likewise in unit 2, the current would flow through the paralleling reactor in a direction that would cause a voltage drop in the control circuit, and 2 would start to raise its voltage. The two units would operate until the circulating current reached a minimum value.

In actual operation, it is certainly plausible that at some time or other, one of the units would be removed from service while the other continues to operate. As soon as this happens, the load current in one regulator would be reduced to zero, and the second unit would try to carry the total amount of load current that was originally supplied by both regulators.

With twice as much current flowing through the current transformer, twice as much would flow through the auxiliary C.T., and twice the effect would be obtained from the line drop compensator. The regulator remaining in service would boost its voltage, which could result in an undesirable high voltage condition.

To eliminate this condition, a paralleling equalizing transformer is also inserted into the control circuit (Fig. 12). Assume that unit 1 is removed from service and unit 2 is carrying twice the load. The secondaries of the paralleling equalizing transformer in each machine are interconnected so that the additional component of load current being carried by 2 is forced back into the control circuit of the de-energized regulator. This assures proper effect from the line drop compensator of 2, and that it will not suddenly raise its output voltage because of the increased current that it must handle.

Sensitivity of the current balance paralleling scheme is so designed that if the units are one

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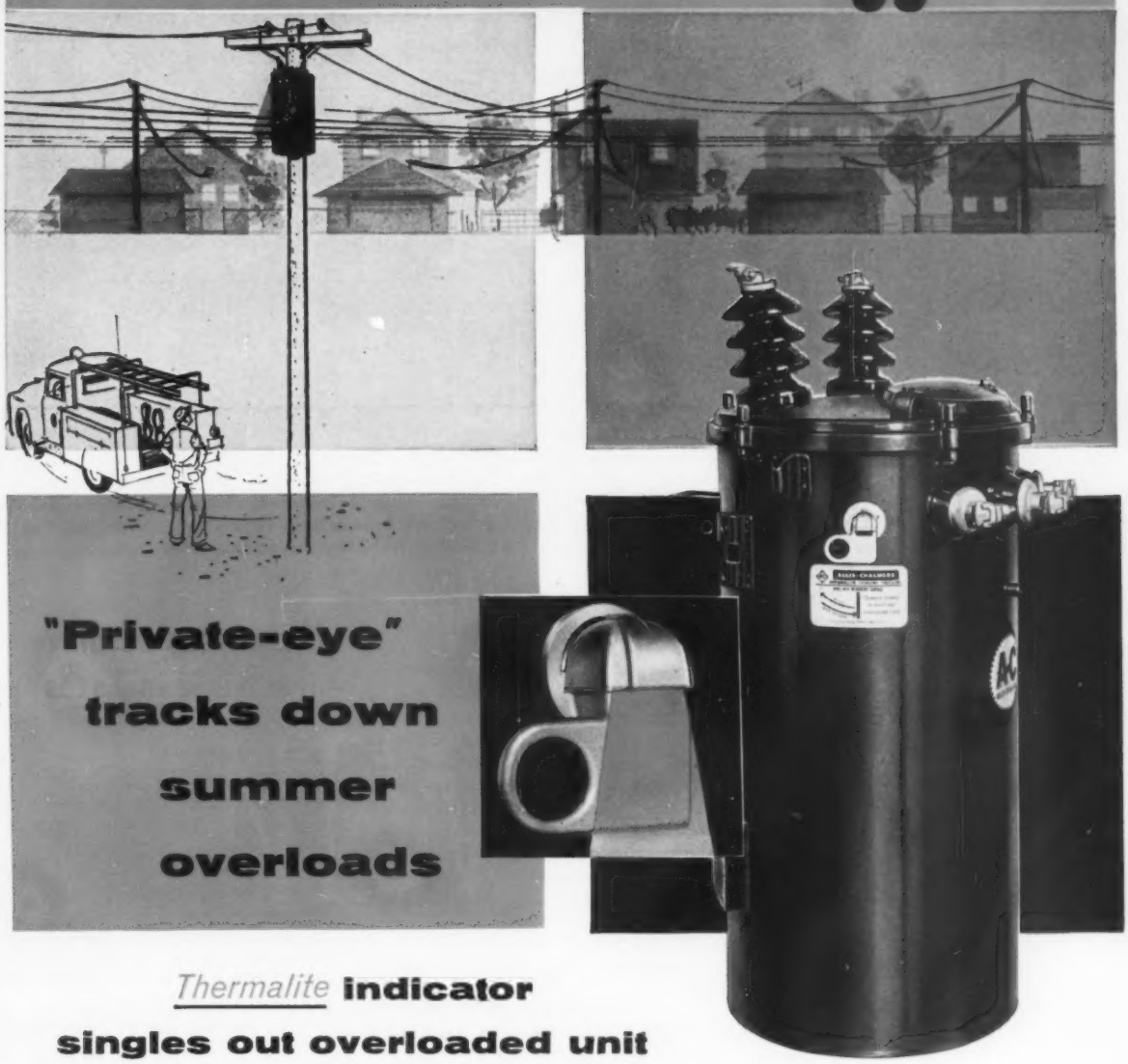

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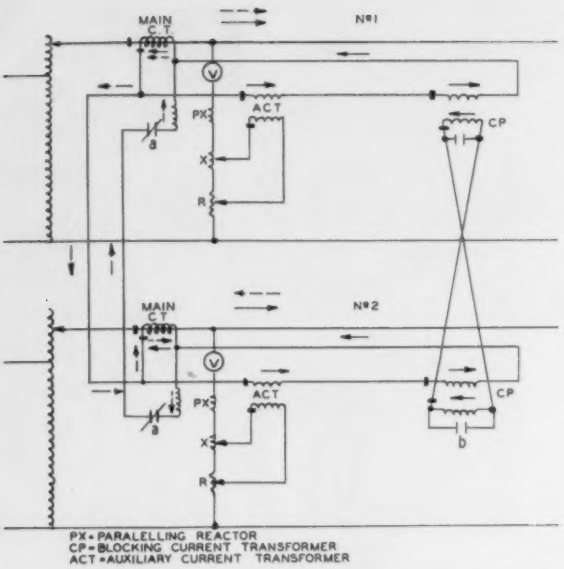

Fig. 11—The diagram given here illustrates connections for paralleling by current balance method. See Fig. 9 for explanation of symbols.

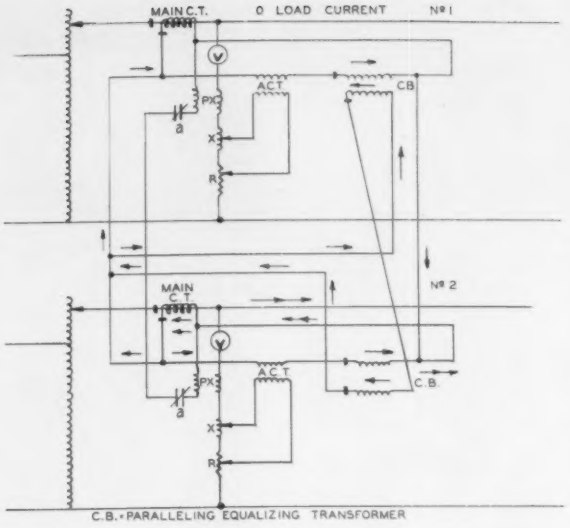

Fig. 12—This refinement of the current balance method of paralleling regulators shown in Fig. 11 utilizes paralleling equalizing transformers.

step apart, the system is stable and the units will not operate. However, if the two regulators get two steps apart, the current balance system becomes unstable, with the result that the two units will tend to move to within one step of one another. As a general rule, the units will normally be one step apart and momentarily two steps apart.

The advantage of this type of paralleling scheme is that any number of regulators can be paralleled. A second advantage is that it can be added quite easily to any standard regulator. It should be kept in mind that it would be necessary to run interconnecting leads between the control panels of the machines to be paralleled.

Interlocked regulators

There are some applications in which regulators are operated in parallel for a few months out of the year, but the remainder of the time they are operated as individual units. By incorporating a parallel-individual switch in each unit, this changeover is very easily accomplished. It is not necessary to disconnect any of the interconnecting leads and it provides a simpler and more flexible operating procedure.

On some occasions, it may be desirable to actually interlock the two regulators so that they will either remain on the same tap position or definitely fix the number of steps that the units may be apart.

Today, many reliable electrical interlocking schemes are available. Interlocks can be used to keep regulators on the same tap position (except during the momentary period of actually changing taps) or to keep the regulators one step apart. If several regulators are operated with this scheme, they can be made to have sequential operation as they raise and lower the voltage.

Electrical interlocking schemes, as a general rule, are more costly and require switches and interconnecting leads between units and relays.

More regulators are being paralleled today than ever before. The difficulties that were encountered at one time have been practically eliminated because of improved paralleling schemes, and a thorough understanding of the particular problems involved.

This series will be concluded with two articles on regulator compensation, which will appear in the July and August issues. Reprints of the complete series will be made available if a sufficient number of requests for them are received.

Extra-creep bushings improvised in Texas

◆ AN ECONOMICAL method of obtaining extra creepage bushings for distribution equipment is reported by A. B. Weaver, distribution engineer for Central Power and Light Co., Corpus Christi, Texas. The atmospheric conditions in the company's operating area make it desirable to operate distribution transformers, reclosers, capacitors, and sectionalizers with extra creep bushings.

The normal method of obtaining the extra creep on old equipment is to purchase new extra creep bushings and junk the standard bushings. However, reports Mr. Weaver, the transformer shop foreman at Harlingen, Roy Daniels, developed a method of cutting the top off of one short bushing and the bottom off of another one and joining the two sections together by use of epoxy cement to obtain the 17-plus inches of creepage distance needed.

This method has been used now for some time, and the operation appears successful. The fact that the method requires two standard bushings to make one extra creep bushing has not been a problem as the company has a large number of the standard bushings in surplus.

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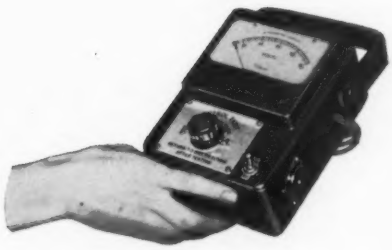

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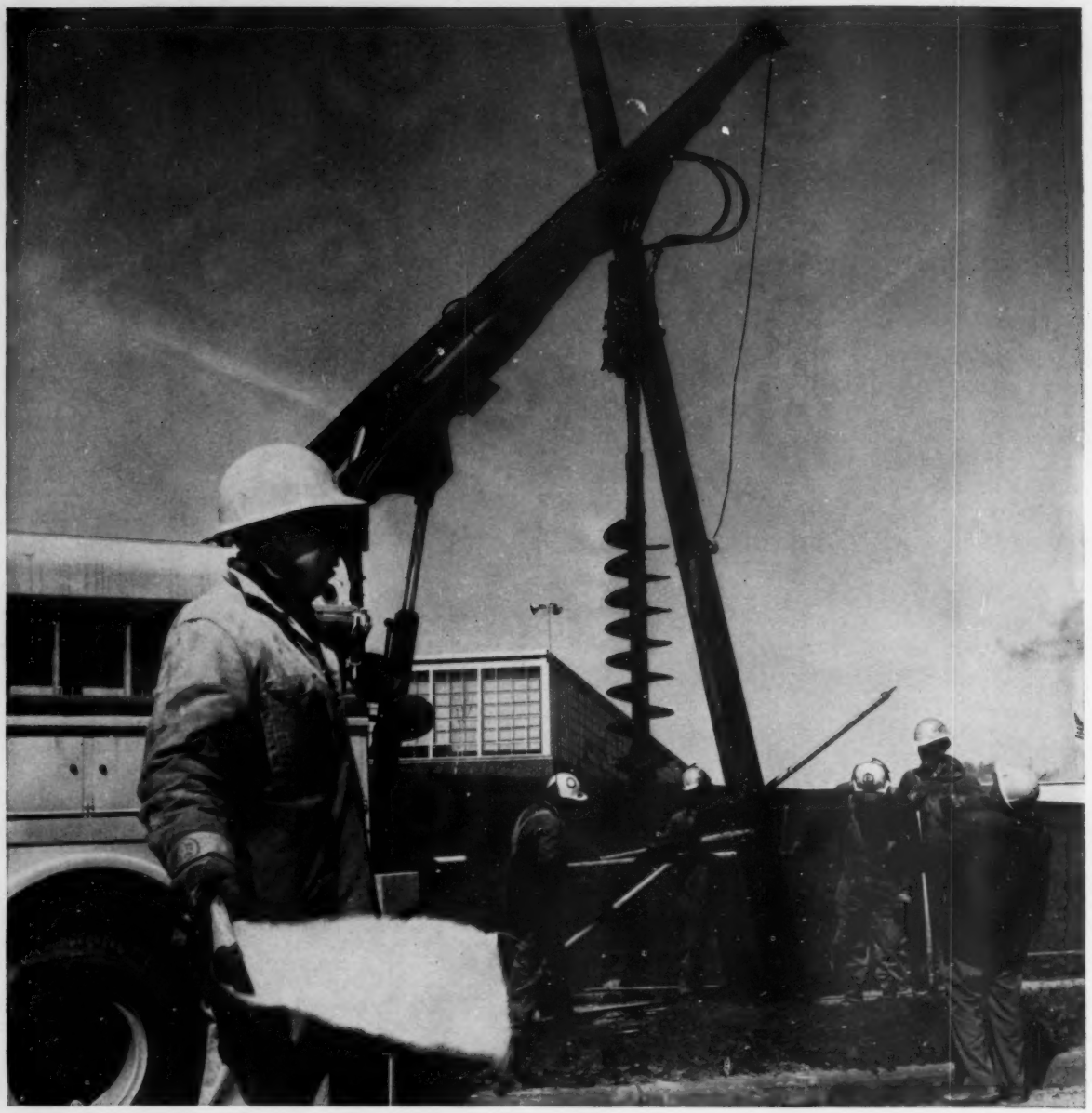

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NEMA wire-cable group reports copper use up

◆ COPPER PRICES, which have been subject to "frequent and violent fluctuations" are due for a period of greater stability with production facilities now geared to demand, Simon D. Strauss, vice president, American Smelting and Refining Company, told wire and cable company executives at their recent 3-day annual spring convention at Westchester Country Club, Rye, N. Y. The meeting, which opened April 27 and closed April 29, was sponsored by the Wire and Cable Section of the National Electrical Manufacturers Association.

Mr. Strauss predicted that copper consumption in the United States will show a 15% gain in 1959 over 1958, and that a strike in the domestic copper industry "may be avoided this year."

The convention was keynoted by C. A. Kirkpatrick, professor of marketing, University of North Carolina, who informed his audience that "customers are the bosses of sellers; that sellers are inclined to overrate their authority, and they make the mistake of assuming that they control their futures." Looking into the future, Mr. Kirkpatrick said:

"We read all sorts of rosy predictions for the 1960's. Production, employment and investment are supposed to be high. It is to be the decade of many marriages, the establishing of many new households, the birth of many babies. Gross national product is expected to reach new highs. But, this can come true only if goods and services are sold . . . and customers will not buy all they should unless they too are sold."

Declaring that "marketing's role is one of control" and that it "dictates what shall be made, and how much," Mr. Kirkpatrick told the company executives that the position of "vice president-marketing is twice as demanding as that of vice president-production." Every successful salesman, he said, should be five different persons—"an informer, a transformer, a performer, a reformer, and a conformer." He urged his listeners to do everything possible to raise the stature of salesmen, and to correct the misconception that "a man who isn't good enough to do anything else can always become a salesman."

Inter-industry regulations

One of the features of the convention was an Inter-Industry Relations program which was addressed by Martin Gainsbrugh, chief economist, National Industrial Conference Board; Milton Allen, vice president of sales, Philadelphia Electric Company; Arthur W. Hooper, executive director, National Association of Electrical Distributors; George Roscoe, director of public relations, National Electrical Contractors Association, and H. E. Cook, executive secretary, Electrical Association of Detroit.

Mr. Gainsbrugh provided an optimistic background by stating that physical volume of factory output "has rebounded to its pre-recession peak and unemployment soon will return to levels which have prevailed in past periods of prosperity." The economist also said that "the rate of recovery in the quarter just ended compares favorably with the pattern of recovery in the closing half of 1958" and that "rising consumer optimism backed by higher income should contribute toward record-breaking retail trade in the months ahead." And, he added, "corporate profits have risen markedly in recent months providing further impetus to recovery in capital goods spending."

Mr. Allen's address was concerned with the concept of "good wiring." He set the stage quickly by listing the benefits which each important segment of the electrical industry receives when homes have sufficient electrical capacity to provide for all of the present and future power-using appliances, equipment and lighting needed for the best in today's modern and convenient mode of living.

In discussing the foregoing points, Mr. Allen enumerated "good wiring" benefits accruing to branches of the electrical industry as follows:

"Electrical contractors have a tremendous stake in good wiring, not only in new homes but in the increased number of re-wiring jobs in old homes. Appliance dealers are very much interested because it is much easier to sell appliances if the bottleneck of inadequate wiring is first eliminated.

"Distributors and wholesale suppliers want to increase their sales of wiring and wiring devices and appliances, so both have a big stake in improved wiring. Manufacturers of switches, outlets, circuit breakers, connectors, boxes, conduits . . . and I have not been all-inclusive by any means . . . get the direct benefit of any increase in either new wiring or wiring modernization."

In speaking of benefits to be received by the utility companies, Mr. Allen explained: "Wiring in itself, no matter how good, will not sell a single additional kilowatt hour. Only if additional load is put on the line can the utility benefit. All of the other elements benefit first—the contractor, appliance dealer, the distributor, the manufacturer—before the utility can show any gain from better wiring."

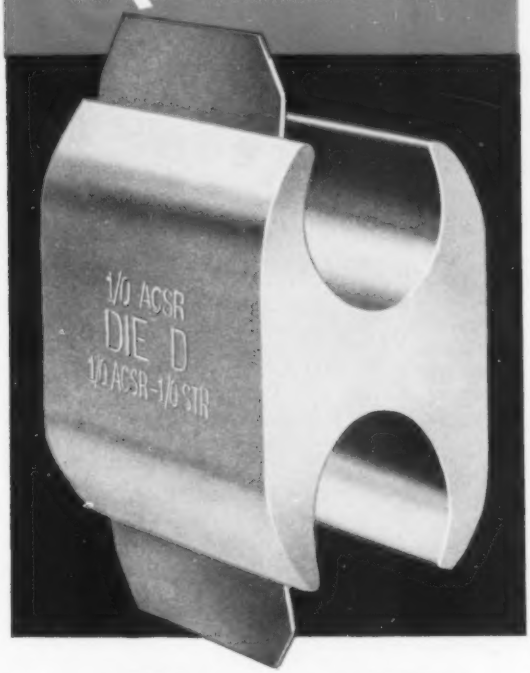
Turning next to the wire and cable companies, Mr. Allen told his listeners that "you in the wire and cable industry benefit twice—not only through additional sales of building wire and service entrance cable used in homes and other buildings, but through sales of wiring materials to utility companies as their electrical load continues to grow." Mr. Allen followed this last statement with the comment: "and, gentlemen, the load won't grow without better wiring in the homes of America."

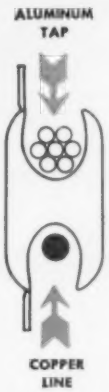
Profitless liabilities

Mr. Roscoe reported that electrical construction had "recovered from the decided slump that started last June" but lamented conditions where, he said, "most of us insist on producing and serving without a profit . . . or at least without a profit adequate to let us grow as required by the expand-

(Continued on page 123)

new! KEARNEY DOUBLE-TAB SQUEEZON



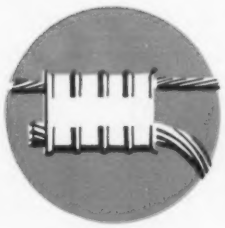


Exclusive Kearney design permits either groove to be used for line or tap. Diagram illustrates Double Tab Squeezon used to make an aluminum "step-up" tap to copper line connection.

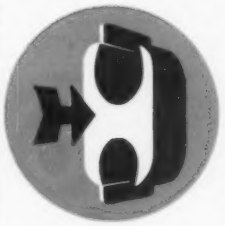
NOW! The Easiest Way to Make Both "Step-Up" and "Step-Down" Tap Connections on All Combinations of Copper, Aluminum and ACSR

The newest, most versatile Squeezon Compression Connector. Dual, fully open groove design, exclusive with Kearney, eliminates need to thread tap conductor through fitting. Use *either* groove for line or tap . . . make "step-up" or "step-down" tap connections quickly and easily. Double Tab Squeezons speed up deadending, too. Form the loop . . . drop the conductors into the open grooves . . . and compress! On insulated wire, remove only a "Squeezon-length" of insulation!

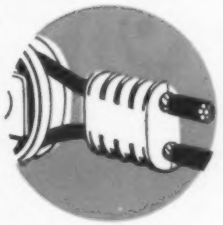
Available in a range of size combinations for aluminum, copper or ACSR. (Write for Selector Card.) Individually packaged in handy "Snap-Open" boxes; grooves factory-filled with Kearnalex inhibitor and contact aid.



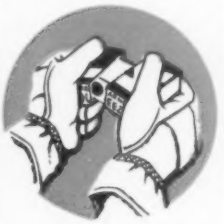
REVERSIBLE
The only compression connector with built-in spacer that makes *BOTH* "step-up" and "step-down" tap connections, from copper to ACSR, aluminum to ACSR, or aluminum to copper.



MASSIVE SPACER
Separates conductors . . . eliminates strand cutting . . . and aids in the prevention of galvanic corrosion between dissimilar conductors.



SECONDARY DEADENDING
Faster, easier. No threading through . . . form the loop, position Squeezon and compress! On insulated wire, strip only enough insulation to make the connection.



"SNAP-OPEN" BOX
Individually packaged. Box snaps apart along perforated line . . . INSTANTLY, CLEANLY . . . even with gloves! No stripping, no peeling.

NO DISTORTION
Squeezon groove jaws completely encircle conductor when compressed . . . provide dependable long-line, full circumference contact without distortion or damage to conductor.

for better construction . . . safer maintenance . . . specify KEARNEY products

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

JUNE IS L-M SUBSTATION MONTH!

New L-M Feeder-Pak® Provides Compact, Low-Cost, Low-Voltage-Side Unit

Shipped in pre-wired, assembled sections, ready for fast, economical installation in substation as complete 15 kv feeder unit.

by **W. V. SWAN,** Product Manager
Power Switching Equipment
Line Material Industries

The new L-M Feeder-Pak is a complete unit for the low-voltage side of a substation. It provides support for feeder conductors, disconnect and by-pass switches, lightning arresters, current transformers, and substation-type R or W three-phase Kyle heavy-duty recloser.

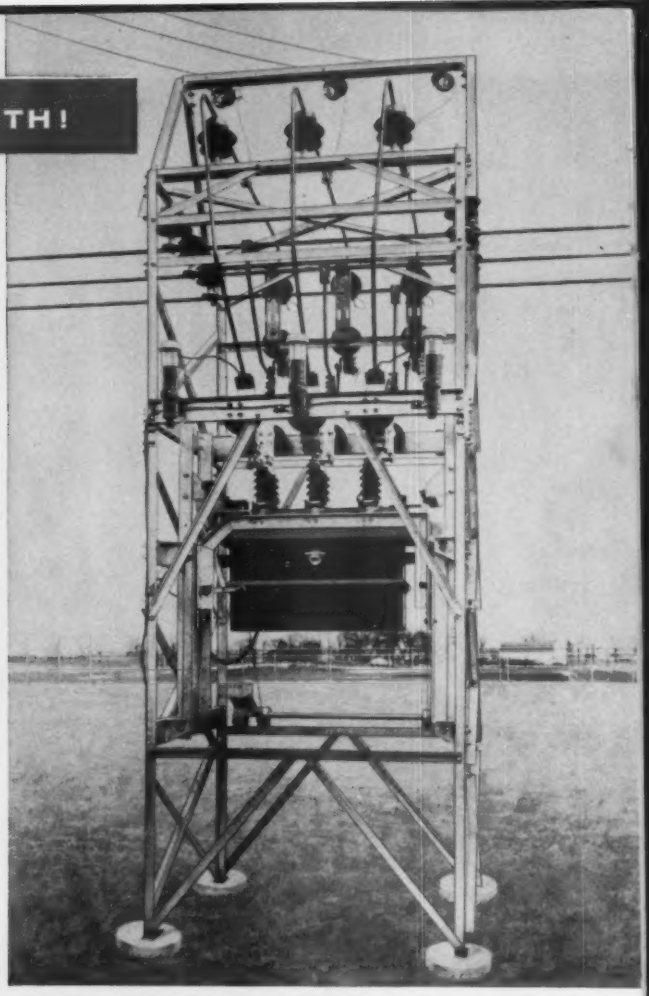
Neat, Compact

The unit has a very neat appearance. It is compact, easy to install. The whole unit comes in easy-to-handle crates. Additional units can easily be added when additional feeders are needed. Or units can be removed to other locations.

The Feeder-Pak costs about the same as the *materials* for a conventional open-type feeder position, but installation costs are far lower. Bus, insulators, switches, and arresters are all in place. No concrete pad is needed—only footings for the four legs. And it takes less land area—it's only 5 feet, 4 inches square!

Easy to Install

To erect the L-M Feeder-Pak, simply bolt the lower section to the concrete footings; set the upper section into the lower section and bolt; raise the recloser into position with the hoisting mechanism included in the lower section. Self-aligning bayonet-type contacts work automatically as recloser is raised into position. Automatic interlock prevents lowering the recloser until recloser contacts are opened.



THE NEW L-M FEEDER-PAK. The lower pre-assembled steel section contains the recloser, and recloser lifting frame and lifting mechanism. The unit is neat, compact. Base is only 5 feet, 4 inches square. It saves land, cuts installation and maintenance time. No mounting pad is required—just footings for the four legs.

L-M Feeder-Pak Features

1. With Kyle Type R or W recloser provides complete structure and equipment for low-voltage side of the substation.

2. Complete; compact; neat. Saves land costs; requires no pad; cuts installation man-hours.

3. Shipped as partly assembled units, crated for easy handling. Switches, arresters, and recloser disconnects are all pre-wired, and installed. Current transformers if desired.

4. Additional feeder positions are easy to add; or the Feeder-Pak may be removed to another location if desired.

5. Recloser lifting frame and tank lifting device make recloser maintenance safe and simple.

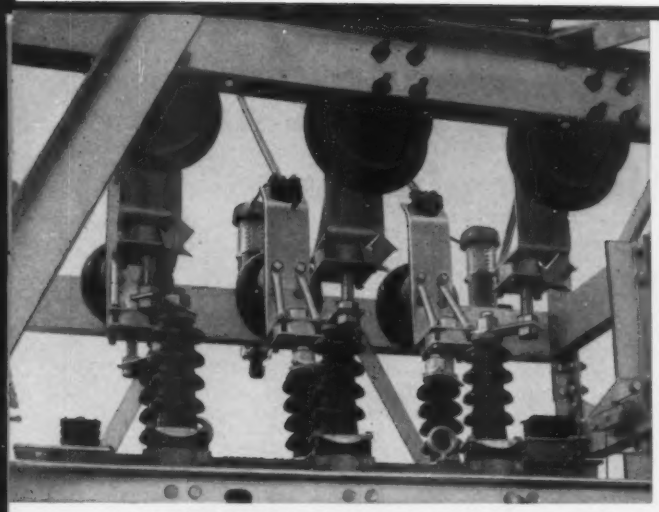
LINE MATERIAL® Industries
McGRAW-EDISON COMPANY

McGRAW EDISON

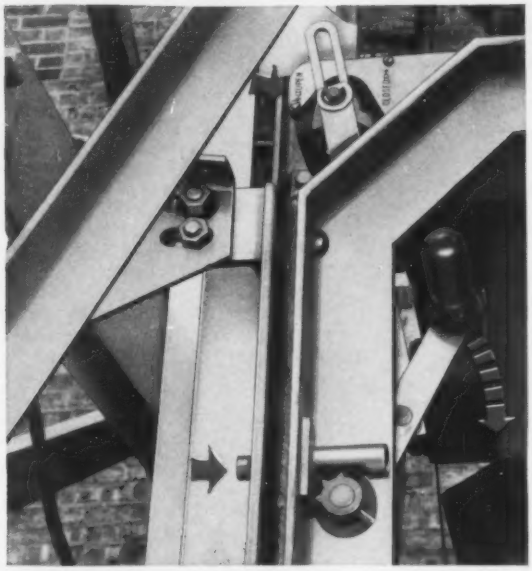
Substations and Power Switching Equipment®

399

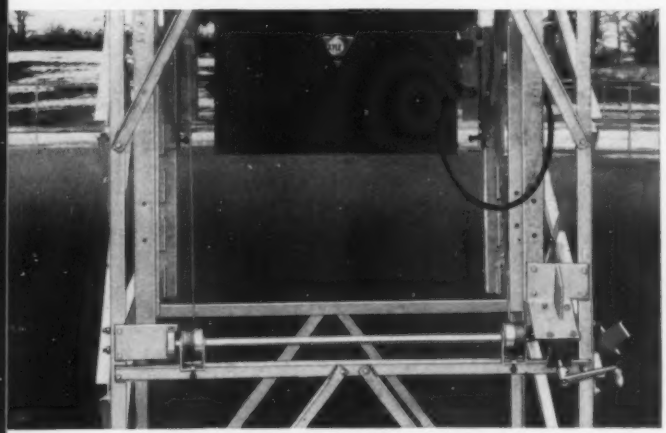
DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



BAYONET CONTACTS on the recloser bushings are raised into the self-aligning automatic disconnects when the recloser is lifted into position. Thus connections are made safely, simply, and automatically.



CONTROL LEVER INTERLOCK. Recloser cannot be lowered until recloser contacts have been opened by moving the handle down (arrow).



RECLOSER LIFTING MECHANISM makes it easy to lower the recloser, and, if desired, to lower the tank to inspect the mechanism, change coils or time-current characteristics —which is easily and accurately done on Kyle reclosers— or for periodic oil change.

LINEMAN CLOSES BYPASS SWITCHES before lowering the recloser. These are L-M Type HXO heavy-duty fused switches. They are mounted on the frame and connected to the bus at the factory.

WHEN LOWER FRAME IS MOUNTED ON FOOTINGS, upper sections are simply mounted into position and bolted to the lower section at the corners. This is all it takes to assemble the entire unit!

Get This Data on New L-M Feeder-Pak

Let us provide complete information on standard equipment and optional accessories. Then check your own present and proposed substation locations to see how this new L-M Feeder-Pak will save you money and man-hours, installation and maintenance. Talk to the L-M Field Engineer. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

Notes on new utility equipment

Digital demand recorders available in two models

THE FISCHER and Porter Company and the Sangamo Electric Co., Springfield, Ill., have announced an agreement under which Sangamo will sell FP punched tape digital demand re-

corders and translating systems to the electric utility industry on an exclusive basis.

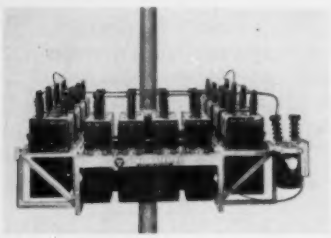
Two models of translators will be made available through Sangamo. A simplified model for translating tape data and properly identifying this data and a larger model that incorporates all the features that might be desired in tape translation.

Tape translating analysis service will also be made available at nominal cost from the Sangamo factory at Springfield, Ill.

Write U-601 on reply card, page 19.

Aluminum racks designed for 100-kvar capacitors

SINGLE-ROW and cluster-type racks for 100-kvar capacitor units, offered by Line Material Industries, Milwaukee 1, Wis., facilitate installation of pole-mounted capacitor banks. Single-row racks can accommodate 300, 600, or 900 kvar, while cluster-type racks can accommodate 600, 900, or 1200 kvar. These racks



can be direct-pole mounted or pole-band mounted by means of an optional accessory.

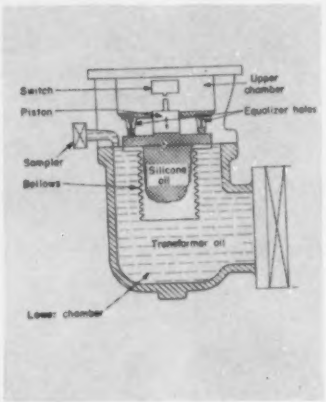
Both types of racks are fabricated of corrosion-resistant, lightweight aluminum. All-welded construction is used for the single-row racks and for the single-phase sections of the cluster-type racks. A ground clamp and aluminum-coated steel bolts for mounting capacitor units are furnished with each rack.

Single-row and cluster-type racks are available as complete assemblies, switched or unswitched. They are assembled and wired for immediate field installation.

Write U-602 on reply card, page 19.

Fault pressure relay available on transformers

A NEW FAULT pressure relay which incorporates a unique pressure differential or equalizing feature to prevent false operation, has been introduced by the General Electric Co., Schenectady 5, N. Y. Function of the



relay, called the Type J, is to help prevent a power transformer from operating in a damaged condition.

The relay is designed to respond only to internal transformer faults and not to line through-faults, system surges or mechanical shock and vibration. It signals circuit breakers to open and deenergize the unit.

Normally located on the transformer tank near the base, the J-relay operates from the primary shock wave produced in oil by a fault. G.E. engineers believe that more rapid and accurate response, and hence better transformer protection, is possible when this mounting location is used.

Operation will occur whenever the pressure increases at a rate exceeding 0.5 psi/sec. Response time is about 3 cycles for an oil pressure rate-of-rise of 18 psi/sec. The new device will operate in one cycle when a major fault occurs.

Write U-603 on reply card, page 19.

Disconnect switches have double latch lock

A NEW LINE of hook operated disconnect switches has been introduced by Turner Electric Corp., 9510 St. Clair Ave., East St. Louis, Ill. These

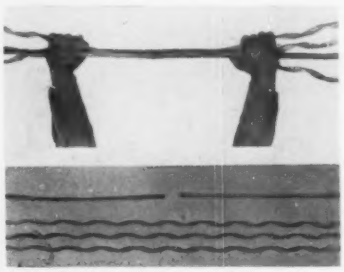
switches are available in voltage ratings of 5 kv through 69 kv and in current ratings of 400, 600, 1200 amps. All disconnects comply with NEMA specifications for heat rise, surge currents, center distances, and insulators.

Among the advantages the manufacturer claims for the line are the following: extra large pull ring, treated with a special reflecting material for ease of operation both day and night; blade of one piece, square copper tubing formed to withstand the maximum side thrust; positive double latch lock when the blade is in the closed position.

Write U-604 on reply card, page 19.

Method of splicing wire will not permit slippage

THE FANNER Manufacturing Co., Brookside Park, Cleveland 9, Ohio, now has available an addition to its product line called Fannsplices. A Fannsplice is essentially a group of

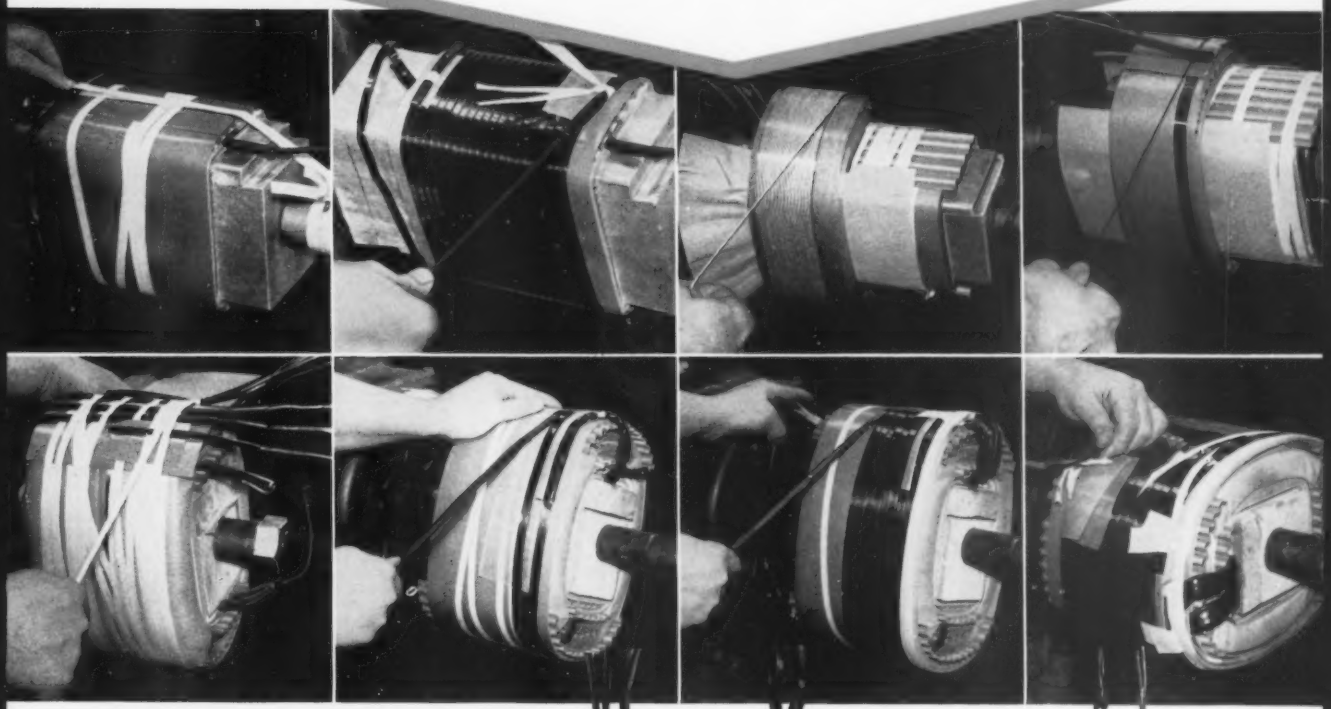


Fanner's superformed helical splicing rods which have been pre-assembled into sub-assemblies coated internally with special high-friction material. Fannsplices are made of high-grade spring type alloy wires, which have

MOLONEY DISTRIBUTION TRANSFORMER COILS . . . DESIGNED FOR PERFORMANCE

The coils used in Moloney Distribution Transformers are composed of materials especially selected and carefully tested for this specific application. These materials, used under the supervision of experienced transformer design engineers, result in a mechanically-strong, electrically-efficient coil. One feature of this coil is the low impedance which results in improved voltage regulation and therefore increased revenue and better customer relations. Specify the transformers designed for performance . . . Specify Moloney Transformers . . . All Along The Line.

ME59-3



- Turns anchored in place.
- HV winding sectionalized to reduce layer stresses.
- Thermo-setting resin-coated paper used between layers.
- All leads vinyl covered where they are brought through the coil.
- Cooling ducts strategically located.
- LV-HV-LV sequence of coils gives optimum clearance from HV to ground.
- Extra insulation on coil leads, connections and taps.

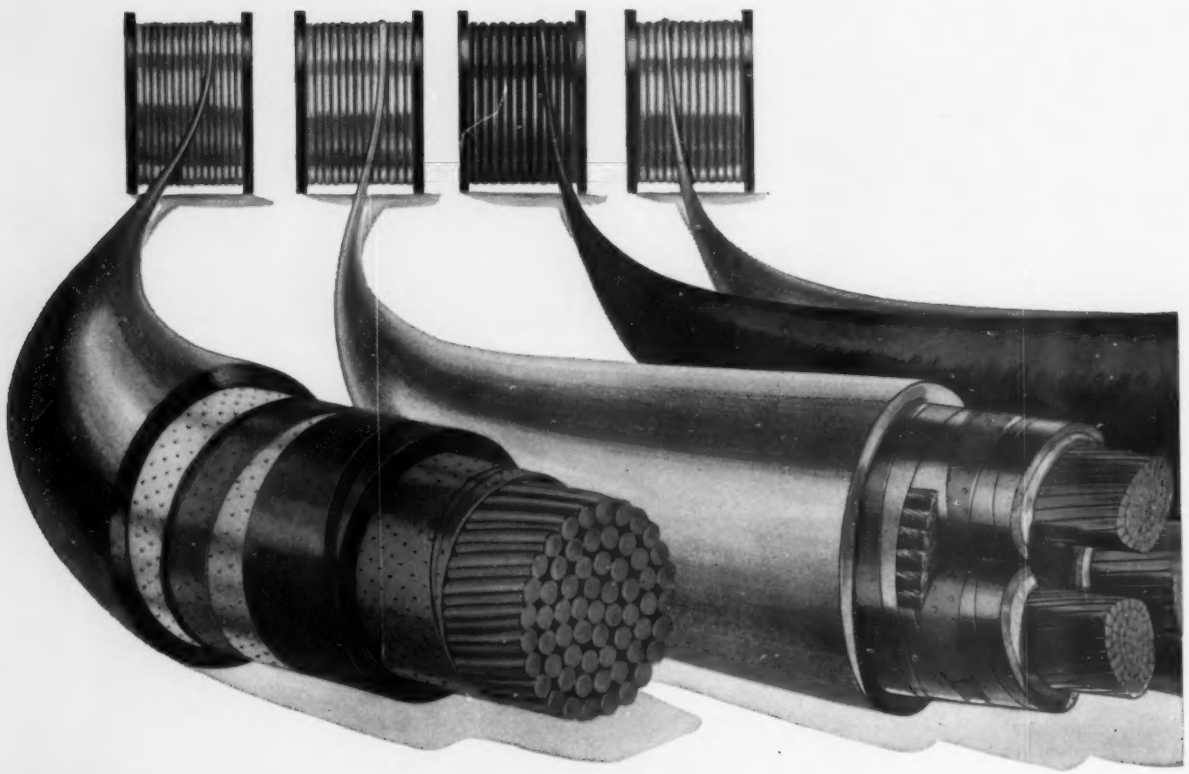
MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT.

FOR THE MOST EFFICIENT
POWER DISTRIBUTION . . . SPECIFY

PAPER-INSULATED CABLES BY PHELPS



Single conductor, 1 KV and up

Three-conductor, 1 KV and up

DODGE!

Phelps Dodge paper-insulated power cables have a *demonstrated record* of long life in a great variety of designs for all types of applications—underground duct, direct burial, submarine and aerial.

Paper-insulated cables have these important inherent characteristics that improve operating performance and lengthen service life:

- Extra high 60-cycle and impulse strength to withstand switching and lightning surges.
- Ability to handle large blocks of power in single cables of minimum dimensions.
- Positive protection against all contaminations, due to being hermetically sealed in an extruded metallic sheath.

Paper-insulated cables can be supplied with either lead or aluminum sheaths.

Phelps Dodge offers the widest range of high voltage cables to the electrical industry.

PHELPS DODGE COPPER PRODUCTS
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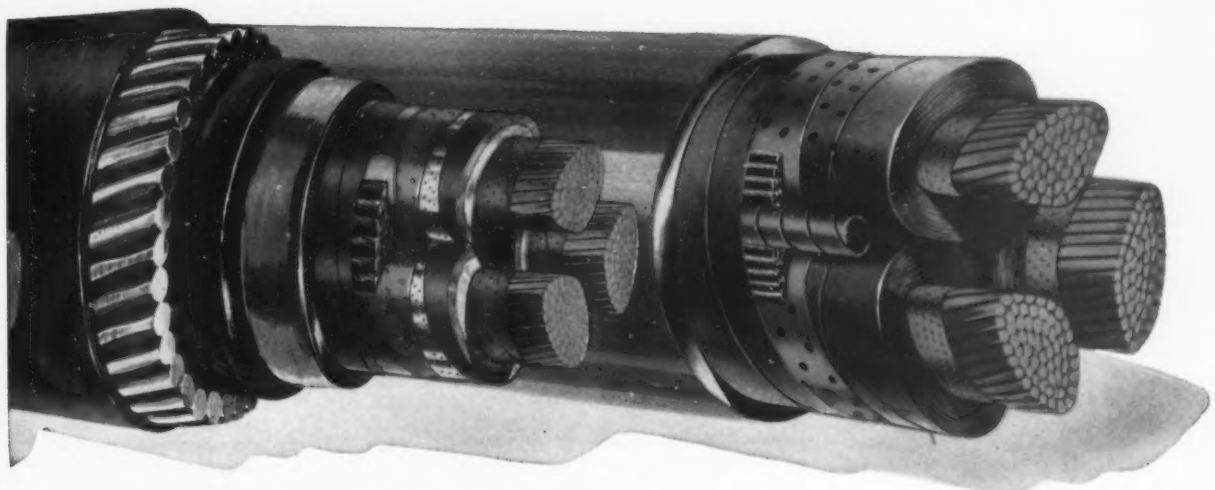


Submarine, 1 KV and up

Low-Pressure gas-filled, 8 KV and up

a high combination of mechanical and electrical properties similar to the underlying strand for which they are designed.

Fannsplices can be applied by hand without the use of any tools, compressors, etc., and because they are permanently spring-loaded, when applied over the wire or strand, they will not permit slippage under any type of loading.

Fannsplices are being recommended for messenger splicing in open-span applications, or for strengthening conductors which have been damaged at support points. They are available for most sizes of steel strands, Copperweld, and aluminum strands and conductors.

Write U-605 on reply card, page 19.

Substation fixture has prismatic glass lens top

HOLOPHANE No. 04252, a new outdoor substation fixture with prismatic glass lens top, has been developed by Holophane Co., Inc., 342 Madison Ave., New York 17, N. Y. The arrangement of refracting and

reflecting prisms in the lens top and refractor result in maximum utilization of illumination on disconnect switches and other overhead components.

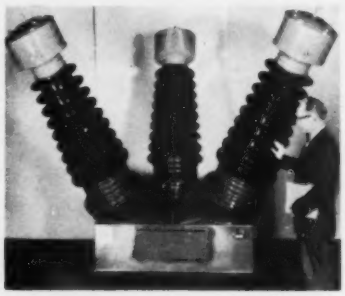
The new lens top unit produces two peaks of maximum candlepower, one at 105° and another at 180°, or directly above the fixture. These distributions were built into the optical design of the complete prismatic refractor with top lens assembly so that all types of stations can be lighted effectively regardless of heights of disconnect switches. Use of new lens top units will guarantee high footcandle, glare-free, shadowless illumination on all overhead substation equipment located in the range of 25 to 100 feet above ground.

Mechanical assembly of the new fixture matches its outstanding lighting performance. Ease of installation and simple maintenance were objectives achieved by the new fixture design through use of a positive seating slip fitter on the fixture base suitable for bracket or post top mounting and a removable top lens assembly.

Write U-606 on reply card, page 19.

New potential transformer smaller and lighter

A 3-PHASE potential transformer for high-voltage operation has been introduced by Westinghouse Electric Corp., P. O. Box 2278, Pittsburgh 30, Pa. Available in 550- and 650-kv



BIL ratings, the new transformer (type APT) is smaller and lighter than conventional combinations of three single-phase units while having the same metering and relaying performance. In addition, it is lower in price and has lower foundation and installation costs.

The new potential transformers use a Form-Fit steel tank construction, solid insulation, and maintain all standard ASA clearances.

The 550-kv BIL unit measures 99 inches from base to bushing tips, and has about 32 x 60-inch dimensions at base. Weight is only 5400 pounds.

All secondary terminals are in one conduit box to simplify wiring of any circuit connection. The conduit box is bolted to the front of the case and permits removal of the transformer proper without disturbing secondary connections.

Write U-607 on reply card, page 19.

New type steel wire coated with aluminum

PREFORMED LINE Products Co., 5349 St. Clair Ave., Cleveland 3, Ohio, has recently introduced a new line of splices, armor rods, and "guy-grip" dead-ends made of "Alumoweld," a new type of steel wire having a thick coating of aluminum, which is particularly suited to conditions requiring high conductivity, extra strength, and corrosion resistance.

The "Alumoweld" series is designed to hold the full strength of the compatible strand. Sizes are available to accommodate all 3- and 7-wire conductors and guy strand sizes which are currently being offered in the new "Alumoweld".

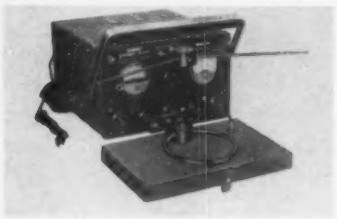
Write U-608 on reply card, page 19.

Interference locator designed for utilities

THE NEW Model 500 interference locater from Sprague Electric Co., North Adams, Mass., is keyed to the needs of electric utilities. It is a versatile, economical, easy-to-operate instrument that is of great value in the rapid location of radio and TV interference sources. The instrument is also effective in preventive maintenance programs, since many incipient faults begin to emit detectable radio noise before actual service failure occurs.

The new Sprague Model 500 locator is a compact, rugged, and sensitive instrument. It provides a wide frequency range, tuning from 550 kc to 220 mc in six bands. This covers the standard broadcast, short wave, F-M broadcast, and VHF-TV spectrums.

The instrument is powered from either a 115/230 volt, 50-60 cycle

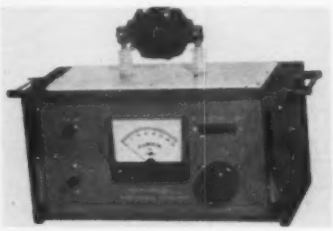


external supply, or in field use by a self-contained rechargeable wet cell. A battery-charger is also built into the unit with sufficient capacity for overnight recharging of the battery.

Write U-609 on reply card, page 19.

Tester for insulating oils compact and light weight

SO COMPACT and light weight is the new high voltage tester for insulating oils, introduced by Associated Research, Inc., 3777 W. Belmont Ave., Chicago 18, Ill., that it may be used for on-the-spot tests of insulating



oils in transformers, h.v. capacitors, bushings, or oil immersed components and power supplies.

The new Model 4505-A hypot weighs only 42 pounds in comparison with 75 pounds for its predecessor. Size has been reduced to only 8½ inches in depth, 16 inches in width, and 8 inches in height. As a result, this instrument offers convenience

A secondary capacitor for *lowest* installed cost per kilovar

Sangamo Secovar 240 volt secondary capacitors are installed at the customer's service to give maximum system benefits all down the line. This new addition combines a 2 kvar capacitor with a meter socket. When used in new construction or when re-wiring, the only installation cost involved is that which would normally be required for a meter socket.

Sangamo's exclusive Secovar Capacitors are available in three types to meet your requirements: The new Type OS (Original Socket) 2 kvar rating; Type S, a 2 kvar rating for socket mounting; and Type N, a 1 or 3 kvar rating for nipple mounting. All types are fused and some models can be furnished with a Klixon thermostatic switch if desired.

For details, consult your Sangamo Representative, or write for Bulletin 1132.

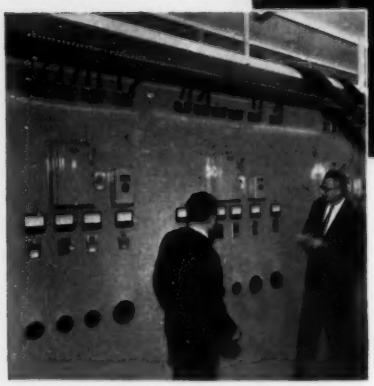
SANGAMO ELECTRIC COMPANY
Springfield, Illinois

PC59-3

Blackburn's

New Testing Facilities

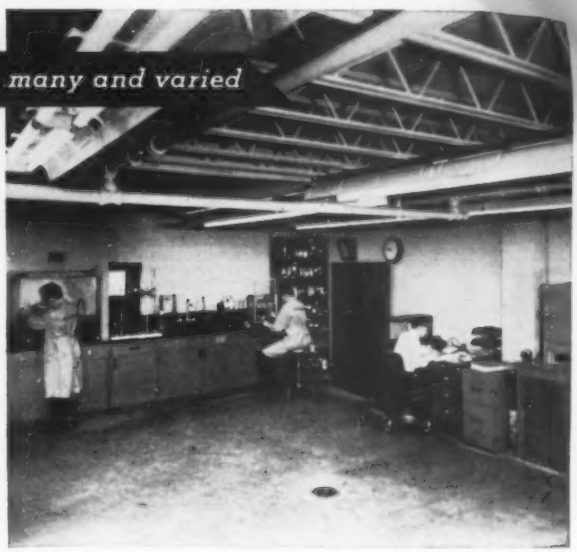
give accurate test data for utilities, precise evaluation of design ideas



PART OF THE CONTROL PANEL of Blackburn's recently completed current cycling laboratory. John A. Toedtman, Chief Engineer (left), and Ken Way, Vice President, observe tests in progress.

NEW CURRENT CYCLING LABORATORY features virtually draftless air conditioning and a means of closely controlling ambient temperatures throughout the test area. Control of these factors permits truly precision testing of connectors. This photo shows Blackburn laboratory technicians taking resistance and temperature measurements of test connections. These new facilities permit testing of more than 500 connectors simultaneously. Advanced testing facilities like these enable Blackburn to provide you with the proper fitting for every operating condition.

. . . and the tests are many and varied



THE GENERAL LABORATORY, a portion of which is shown here, is the scene of a great variety of tests. Hardness, yield and breaking strength of parts such as castings, bolts, etc., are determined. Special equipment is available for pull-out or holding force evaluation of all fittings. Clamping force measurements giving the relationship between tightening torque and the force exerted by the connector on the conductor are made here. Microscopic examinations and special electrical resistance measurements are routine. Tests like these give Blackburn fittings great dependability.

THE CHEMICAL LABORATORY is the center for tests to control various chemical process solutions used in production. Electroplating, etching, and metal cleaning solutions are regularly tested here. In addition, special surface treatments are evaluated for friction control and corrosion protection. Thus, this laboratory assures continuous control of quality.

SALT FOG CHAMBER, where tests may continue for hundreds or even thousands of hours. Here salt fog tests are made on wire connections. Test conditions are made in accordance with ASTM specifications. Electrical resistance measurements and visual observations are recorded at regular intervals during the tests.

OUTDOOR EXPOSURE RACKS permit long-term exposure tests which often yield valuable information on weathering resistance not accurately obtainable from more highly accelerated tests. Specimens on these racks generally remain on test for at least a ten-year period.

Look to BLACKBURN for *test-engineered* electrical fittings

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and saving of time by enabling high voltage breakdown tests of insulating oils to be made wherever the electrical equipment is located.

The test voltage is continuously adjustable from 0 to 35 kv a-c at a 2 kva rating to meet ASTM and Federal specifications. Measurement of test potential is made directly at the test electrodes to assure accuracy, The hypot test set operates from 110-120 volts a-c.

Write U-610 on reply card, page 19.

Hot-stick tester plugs into standard outlets

A NEW DEVICE for testing insulated tools has been developed by A. B. Chance Co., Centralia, Mo. It can be carried and operated by one man. Designed for 110-volt, 60-cycle a-c circuits, the hot-stick tester can be plugged into standard electrical outlets or used on the job by running an extension cord to the secondary. Other than an extension cord, this unit does not require any auxiliary equipment.

The hot-stick tester is not dangerous to the user and will not damage a hot stick that has absorbed excessive moisture. It requires no special skill to operate.

All types and sizes of hot sticks,

regardless of insulated material, can be tested on this unit. It measures true leakage, independent of stray capacitance currents, and operates at ambient temperatures up to 105° F. Since transistors are used, no warm-up is required. Calibration standard, instruction sheet, and sturdy case are included with each unit.

Write U-611 on reply card, page 19.

New static protective relay announced

A NEW STATIC protective relay capable of operating at speeds faster than conventional electro-mechanical designs was unveiled recently by General Electric's Low Voltage

THE TRAFFIC PLAN THAT HANGS FROM THE CEILING

in the new GUTH KOLORKODED* industrial fixtures

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A completely new idea for industrial lighting—a dual-role fixture. First, it delivers the higher footcandle ratings recommended by the Blackwell report . . . and maintains glare-free lighting at the working level.

Second, the built-in traffic lights—red, yellow or green—create lines of color that direct and protect your workers.

These new streamlined Wyteliners® are also available without KOLORKODE for general illumination areas.

Both types banish ceiling shadows and provide comfortable shielding: 10% uplight with 13° cut-off or 25% uplight with 27° cut-off. For 430, 800 or 1500 M.A. operation. Designed for easy maintenance, too!

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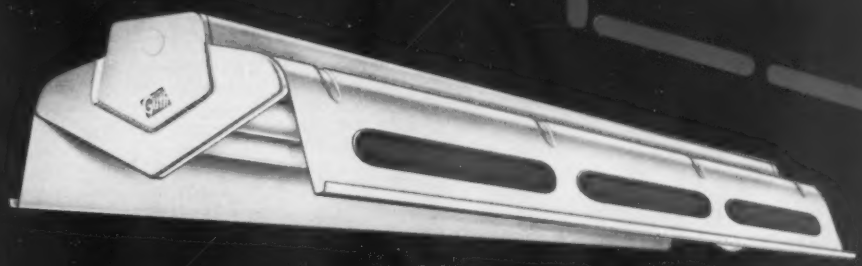
standard porcelain reflector units, without KOLORKODE, for general lighting are RLM listed.



Green for GO
Yellow for CAUTION
Red for STOP

Available in three reflector finishes—Permalux White, Porcelain or ALZAK Aluminum.

ALSO, A COMPLETE LINE OF QUALITY BRASCOLITE INDUSTRIAL INCANDESCENTS

30°, 60° and 90° High Bays with or without uplight

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Mercury Vapor units with or without uplight

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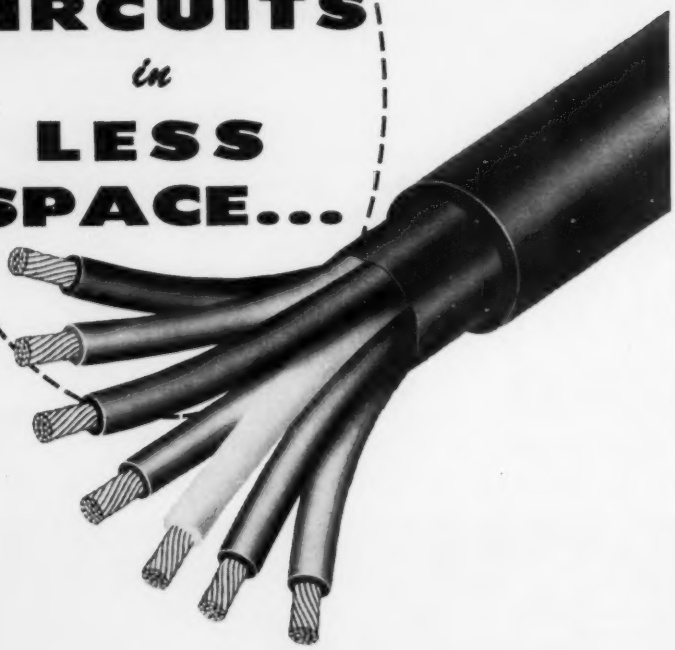

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Superior's SD Control Cable provides for the maximum number of control circuits in the least amount of space!

Overall diameters are reduced by as much as 20% to 35% without any sacrifice of quality or reliability. Armored with tough nylon, the flexible, stranded, polyethylene-insulated conductors are color-coded to your requirements. Non-hygroscopic tape covers the conductor core. The smooth, neat, outer jacket of polyvinylchloride has excellent resistance to oils, acids, alkalis and solvents and eliminates the need for conduits.

For *more* circuits in *less* space, use SUPERIOR SD Control Cable . . . highly efficient, economical, too!

For complete information and prices, write

SUPERIOR CABLES

SUPERIOR CABLE CORPORATION

Hickory, North Carolina

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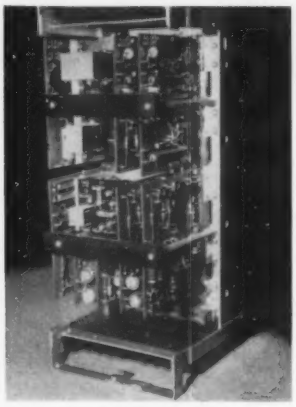
Switchgear Dept., Schenectady 5, N.Y.

Operating within one and one-half cycles, the new static relay greatly reduces damage caused by line faults and improves stability to give better system protection.

Designed for use with General Elec-



tric's new transistorized carrier current equipment, the relay provides high-speed simultaneous tripping of transmission line breakers for all internal faults by comparing phase relationships of currents entering and leaving a line section.

The transistorized units can be widely applied in the protection of high voltage transmission lines.

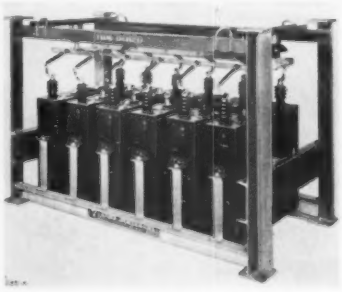
Design flexibility permits use of the relay on multi-terminal transmission lines. Addition of new terminals to existing lines is possible without major changes to the relaying system. Because of its high sensitivity, the new static protective relay detects lower magnitude faults and permits heavier line loading with an equivalent protection level.

Incorporating static components, transistors, stabistors, diodes, and reference diodes, the static phase comparison relay eliminates the necessity of tubes, and their related maintenance costs.

Write U-612 on reply card, page 19.

Capacitor blocks designed for 100-kvar units

FACTORY - ASSEMBLED capacitor blocks, being offered by Line Material Industries, Milwaukee 1, Wis., have been designed for use with 100-kvar units in open type banks at



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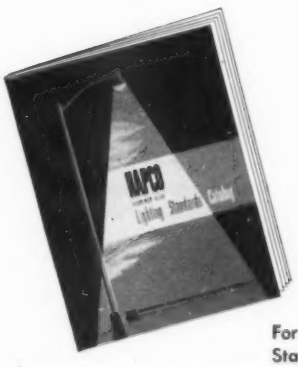

Virginia's 35-mile Richmond-Petersburg Turnpike is another outstanding example of the many streets and highways from coast to coast that depend on HAPCO poles and brackets to help brighten the way for safer night driving.

HAPCO Aluminum Standards offer a new concept in modern styling, permanence and economy in lighting standard design that has made them especially desirable for use wherever outdoor lighting is needed.

For complete information on Lighting Standards and Brackets ask for the new HAPCO Catalog HAL 259. Write to Hubbard Aluminum Products Co., 6301 Butler St., Pittsburgh 1, Pa.

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30 and 60 Amp., 240 V. AC Light-duty Safety Switches for Cartridge Fuses

Designed for easy installation . . . unmatched performance.

Ideal for the protection of such light-duty electrical equipment as refrigerating units in stores and supermarkets—and conveyor units in small plants. Meets *your* needs for easy installation, maintenance; your *customers'* needs for dependable performance and long life.

- **Visible Copper knife blades**
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- **Combines compactness with ample wiring room - - - - equipped with ILSCO lugs**
- **Ample knock-outs**
- **All moving parts clearly visible**
- **Spring-assisted release holds switch in "Off" position**
- **Sturdy box construction**
- **Rating on outside front cover of enclosure**

Both fusible and non-fusible types available. Write for details to The Arrow-Hart & Hegeman Electric Co., Dept. ES, 103 Hawthorn St., Hartford 6, Conn.

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Quality since 1890

MOTOR CONTROLS · ENCLOSED SWITCHES
APPLIANCE SWITCHES · WIRING DEVICES

ARROW AH HART

transmission, subtransmission, and distribution voltages. A standard block consists of two rows of 100-kvar capacitor units, 5-kv or 8.7-kv class, connected in parallel and mounted in a welded aluminum frame of standardized dimensions.

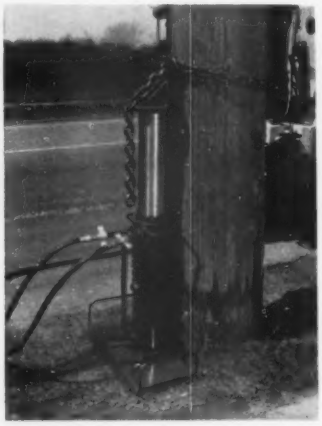
Available blocks have capacities of 600, 800, 1000, 1200, 1400, 1600, 1800, and 2000 kvar. Individual fuses in bus-mounted cutouts protect the units. A complete line of accessories is available, including base support insulators.

These blocks reduce field installation charges because of lighter weight per kvar, and require less substation area per kvar than blocks for 25-kvar or 50-kvar units. Blocks facilitate changes in bank size and voltage rating as varying system conditions require. They also provide flexibility for relocation.

Write U-613 on reply card, page 19.

Pole jack has lifting capacity of 42,000 pounds

HOLAN CORP., 4100 W. 150th St., Cleveland 35, Ohio, is now manufacturing a new pole jack that not only speeds pole-pulling but also has de-



sign features that contribute to a long life for the product.

The Holan pole jack lessens the need for physical effort in pole-pulling. One man carries the jack, sets it next to the pole and wraps a chain around the pole and through the jack. Then, he connects the hydraulic lines from the jack to the truck body and pulls the control lever to activate the ram.

Operating at the maximum 1500 psi, the jack has a lifting capacity of 42,000 pounds. The hard-chromed, double-acting ram is 6 inches in diameter and has an 18-inch stroke. Two 15-foot hose lengths are supplied with the unit and additional lengths are available. A 4-way valve mounted on the truck body controls oil pressure.

The jack and its detachable base are so arranged that the jack can be tilted to allow for uneven ground.

Write U-614 on reply card, page 19.

Know the law

by Arthur L. H. Street

Oral contract not proved

◆ PROBLEM: A plumbing contractor contracted with a general contractor to furnish certain work and materials, including installation of an electric control system. Plaintiff, an electrical contractor, sued the plumbing contractor for an amount claimed for the electrical installation. The electrical subcontractor relied upon an alleged oral agreement between his representative and a foreman of the plumbing company. The existence of this oral agreement was flatly denied by the plumbing contractor's witnesses, and the electrical contractor did not produce as a witness a person who allegedly was present when the oral agreement was made. Did the trial court properly dismiss the suit?

COURT'S ANSWER: Yes. The Louisiana Court of Appeals, Second Circuit, decided that the electrical contractor had failed to substantiate his claim.

Obviously, the lesson to be gleaned from this case is that all agreements for the furnishing of electrical work should be evidenced by written and signed contracts (Levy & Company v. Shreveport Plumbing Company, 108 So. 2d 810).

Dealer liability for sales taxes

◆ A GEORGIA dealer collected sales taxes from customers, as required by state law, and placed the money in a separate fund. Before the proceeds were remitted to the state, the money was stolen from the dealer without fault on his part. Apparently there was no wrongful delay in remitting. Was the dealer liable to the State for the amount of the loss?

No, declared the Georgia Court of Appeals. (Bear's Den, Inc. v. State of Georgia, 102 S.E. 2d 915.) The chief judge of the court reasoned: The title to the money was at all times in the State and if the retailer be regarded as custodian and agent for the State, he was under no obligation other than to use ordinary care for its safekeeping. But it was intimated that the dealer would have been liable if he had not kept the sales tax money separate from his own funds.

Validity of city licensing laws

DOES THE FACT that there is a state law providing for the licensing of electrical contractors necessarily prevent a city from adopting a code or ordinance covering the same subject, if the same does not conflict with the provisions of the state law?

No, according to the decision reached by the California District Court of Appeals, Second District, Los Angeles, in the case of Agnew v. City of Los Angeles, 323 Pac. 2d 165.

The California Business and Professions Code has a subdivision covering the licensing of contractors, including electrical contractors, and giving the 'Contractors' State License Board administrative jurisdiction. It is declared to be a misdemeanor to engage in the business without being licensed by the Board, which is given broad powers.

Wilful or deliberate disregard and violation of the building laws of the state, or of any political subdivision thereof, constitutes a cause for disciplinary action, according to Section 7110.

Section 7071.5 provides that before reinstatement after disciplinary action the board may require the applicant to give a surety bond or make a cash deposit conditioned upon his compliance with the provisions of the Act. Every person injured by the unlawful acts or omissions of such contractor may maintain an action on the bond or a claim on the deposit.

Plaintiff Agnew's lawyers unsuccessfully argued that certain provisions of Los Angeles Electrical Code were unconstitutional, because of the statutory provisions on the same subject.

The Court of Appeal said:

"Appellant contends that the licensing of contractors throughout the state is a matter of general and statewide concern and is not a municipal affair that concerns only the inhabitants of a chartered city and which is subject to local regulations. That the general law has fully occupied the field; that his license from the state grants him permission to conduct his business at any place within the state and that this permission cannot be circumscribed by local authorities." (Here the Court cites several decisions of the California Courts of Appeal upon which plaintiff relied, and then proceeds:)

"It is undeniably true, as urged by appellant, that these cases support his claim that while * * * our State Constitution authorizes a city to 'make and enforce within its limits all such local, police, sanitary and other regulations', the constitutional provision restricts such power to regulations 'not in conflict with general laws'. And the cited cases sustain appellant in his position that a local ordinance is in conflict with general law if it attempts to impose additional requirements in a field which is fully occupied by the general law.

"However, the foregoing cases point out that while it was clearly the intention of the legislature to declare that the licensing and regulation of contractors by the state shall be the only licensing and regulation in the state, nevertheless, as was stated in Horwith v. City of Fresno, * * * 'This does not limit the right of local governmental agencies to protect property and life through the enforcement of local regulations as to the quality and character of the installations. The right to enforce local ordinances is still in the hands of municipalities through the power of inspections and permits.'

"Conceding that the general laws were intended to be the only licensing and regulation of contractors in the state nevertheless, * * * 'This does not limit the right of a city or county to protect life

(Continued on page 123)

Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

- Electrical Contractors
- Electric Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ WE BEGIN this month's discussion with section 3012 which governs the number of conductors in a raceway. Like many other requirements of the Code, this one will be altered in the 1959 Code, which will be available in or soon after September of this year.

One of the most drastic changes in the new Code will be the permissible number of conductors in a raceway. However, to avoid making incorrect statements which could result from last-minute changes in the proposed 1959 Code, we will refrain from discussing these changes until they definitely have become a part of the Code.

We will continue our study of the present Code until the new Code is finally adopted. We will then discuss all of the Code changes up to the point where we left off. This will provide a much-needed review. And then we will proceed from there with our study based on the new Code. (The new Code, incidentally, will have a more logical numbering system which, I predict, you will like better than the old one after you become familiar with it.)

The reason for limiting raceway fill—and the reason, of course, will not be changed—can be discerned in the following statement in section 3012: "In general the percentage of the total interior cross-sectional area of a raceway occupied by conductors shall not be more than will permit a ready installation of the conductors and dissipation of the heat generated

Code test questions

1. In general, the cross-sectional area of the conductors shall not exceed 80 per cent of the cross-sectional area of the raceway if 4 to 6 conductors are used and 70 per cent if 7 to 9 conductors are used. True or false?

2. Conductors may be inserted in raceways before raceway bends are made or before the sections of raceway are installed in place if difficulty would be encountered while inserting the conductors after the raceway is installed. True or false?

3. Pull wires may be installed as the raceways are assembled to avoid the uncertainty of inserting them after the raceways are installed. True or false?

4. Graphite is a safe lubricant to be used for conductors when pulling them in raceways. True or false?

5. Conductor sizes up to and including size 1/0 in vertical raceways must be supported at distances not greater than 100 feet. True or false?

6. Metal raceways may be connected to metal load-center cabinets by means of insulated nipples if:

(a) the nipple is an approved fitting.

(b) the nipple is an approved fitting and if an approved means of bonding around the nipple provides adequate electrical continuity between cabinet and raceway.

(c) #4 or larger wire is used.

Which is correct? a? b? c?

7. Raceways which are exposed to widely different temperatures:

(a) shall have provisions made to prevent circulation of air from a warmer to a colder section through the raceway.

(b) shall have an explosion-proof seal-off where it enters the cold section.

(c) shall have a heat-absorbing outer coating, such as black paint, in the colder section and a heat-reflecting outer coating, such as aluminum paint, in the warmer section to aid in the equalization of temperatures throughout its length.

Which is correct? a? b? c?

8. If two or more raceways are used in which to run a feeder with multiple conductors for each phase and the neutral:

(a) one wire for each phase and the neutral shall be run in each raceway.

(b) the wires may be divided in any manner provided that the terminals are connected in an approved manner and none of the raceways has a greater number of wires than any other.

(c) all of the conductors for phase A shall be run in one raceway, all of the conductors for phase B shall be run in the second raceway, and all of the conductors for phase C shall be run in the third raceway with one neutral in each raceway.

Which is correct? a? b? c?

9. Temporary wiring shall be so installed that:

(a) some means, including the removal or loosening of a screw, will enable disconnection of the circuit.

(b) not more than six movements of the hand are required to disconnect the temporary circuit.

(c) suitable disconnecting switches or plug connectors shall be installed to permit the disconnection of all conductors of the temporary circuit by a single operation.

Which is correct? a? b? c?

10. Temporary wiring:

(a) may have earth returns but shall have no bare conductors.

(b) may have bare conductors but shall not have earth return paths.

(c) shall have no bare conductors nor earth returns.

Which is correct? a? b? c?

Correct answers will be found at end of article on page 123.

without injury to the insulation of the conductors."

Exhaustive tests have proved that insulated wires which occupy more than 40 per cent of the cross-sectional area of a raceway usually cannot be drawn into the raceway without damage to the insulation under everyday field conditions. Even smaller fills are necessary in some cases, such as when lead-covered conductors are used.

And in every case, the number of bends in the raceway must be restricted, or else the insulation would be damaged, anyway, in spite of fill restrictions. (Sections 3471 and 3490 restrict the number of bends to the equivalent of four 90 degree ells.)

The greater the number of conductors in any one raceway, the greater will be the number of heat-generating sources, and the greater will be the difficulty of dissipating this heat. Therefore, since the carrying capacity of conductors is based solely on temperature, the greater the number of conductors in a raceway, the lower will be the allowable current-carrying capacity of each conductor.

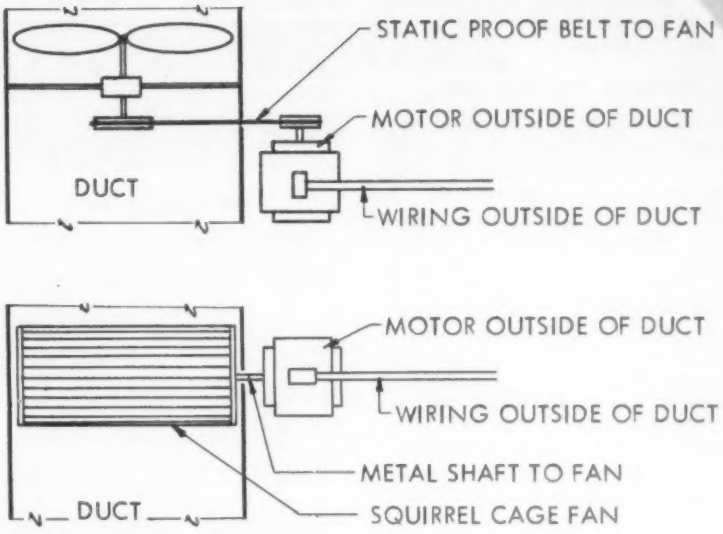
As stated in Note 8 following Tables 1, 1a, 2, and 2a, voltage drop is not taken into account in these current-carrying capacity tables. But for long runs, de-rating is required because of this factor. In normal runs, de-rating is required by Note 4 following these tables to 80 per cent when 4 to 6 conductors are used and to 70 per cent when 7 to 9 conductors are used in a single raceway.

Raceways other than rigid conduit and EMT have exceptions which will be discussed when we discuss these other raceway systems themselves.

Wire pulling lubricants

Section 3013 requires that the entire raceway system be installed completely before the wire is pulled in and that no lubricant be used, in pulling in the wire, which has a deleterious effect on the conductor insulation or covering. This has caused some hair pulling at wire pulling time because graphite is so messy, and because talcum powder and soapstone leave something to be desired as lubricants.

More than one electrician has yielded to the temptation of using various forms of soap for this purpose, some forms of which are more deleterious than others. Fortunately, compounds which are listed by the UL are obtainable and satisfactory.



Fans in ducts used for removal of dusts and vapors must be arranged and wired so that all electrical parts are outside of the ducts. Two methods of accomplishing this are illustrated here.

Supporting conductors in vertical raceways to prevent strain on terminal connections is a very important requirement of section 3014 in which a table lists the maximum length in feet between such supports for various sizes of wire. This section is usually complied with by necessity to prevent the conductors from slipping out of the raceways. The insulated wedges manufactured expressly for this purpose are the only really satisfactory devices for supporting conductors in vertical raceways, and these are almost always used now by competent electricians instead of some of the improvised methods occasionally resorted to in years gone by.

Misunderstood section

Section 3015 is not always understood. It states, "If portions of an interior raceway system are exposed to widely different temperatures, as in refrigerating or cold-storage plants, provision shall be made to prevent circulation of air from a warmer to a colder section through the raceway."

This provision does *not* require an explosion-proof seal such as that required for a raceway entering a hazardous area as defined in Article 500. Since warm air can absorb and carry more moisture than cold air, when comparatively moist warm air travels through a raceway from a warm room to a cold-storage room, the moisture will condense upon being chilled and fill the raceway, fixtures, and equipment with water.

A simple seal to prevent the passage of air is, therefore, all that is needed. Pressure is not involved. Most inspectors permit a fitting for this purpose, such as an "LB Condulet", filled with any kind of compound which is not deleterious to the conductor insulation. Of course, a seal-off suitable for an explosion-proof installation would be *acceptable* for a cold-storage vault if the electrical contractor wanted to go to this expense.

(This section of the Code is hard to find when needed, incidentally. It is not listed in the index under refrigeration or under sealing. It is listed under "Temperature, Exposure to Different, Wiring Methods." The best practice, as mentioned at the beginning of this series, is to try to remember that any section which cannot be found anywhere else is worth looking for in Article 110—General or in Article 300 — General Wiring Methods. This section is in the latter.)

Sections 3016 and 3017 state requirements for assuring electrical continuity and the grounding of metal raceways and enclosures. The methods for accomplishing this, as well as the reasons for doing so, were discussed in this

series in connection with Article 250 of the Code in earlier issues of this magazine.

Multiple raceway use

Section 3018 concerning alternating-current systems in metal enclosures was also explained and diagramed in response to a reader's inquiry in an earlier issue under "Questions On The Code." The part of this section which is least understood and which is most often violated is that part concerning the neutral when multiple raceways are used. This part of the section states, ". . . If the capacity of a circuit is such that it is impracticable to run all conductors in one enclosure, the circuit may be divided and two or more enclosures may be used providing each phase conductor of the circuit and the neutral conductor, if one is used, are installed in one enclosure. . ."

Sometimes a contractor will have a heavy 3-phase power load and a small lighting load requiring a neutral. In such cases, he will run two or more raceways, but he will enclose a neutral in only one of the raceways. For instance, he may run three 3-inch conduits with three 350 MCM power conductors in each and one 250 MCM neutral in only one of the conduits. This is wrong. Instead of one 250 MCM in one raceway, a size 1/0 neutral should be run in each of the three raceways.

Three 1/0 conductors will carry more current than one 250 MCM and would therefore be larger than needed in this case. However, section 3105 does not permit sizes smaller than 1/0 to be run in multiple. In order to comply with section 3105 requiring multiple conductors to be not smaller than 1/0 and also with section 3018 requiring a neutral and each phase conductor to be run in each raceway, the contractor in this case would have to run three 350 MCM phase conductors and one 1/0 neutral conductor in each of the three raceways.

The total cross-sectional area for these four wires is 2.5967 square inches by Table 13. Table 11 requires 4 or more conductors (not lead-covered) to occupy a maximum of 40 per cent of the raceway. Table 12 shows 40 per cent of a 3-inch raceway to be 2.95 square inches which is greater than 2.5967. Therefore, three 3-inch conduits would be acceptable in this case.

A size 250 MCM neutral, if run in each conduit, would also have been acceptable in this size conduit. A neutral of this size, when added to the three 350 MCM phase conductors, would have a cross-sectional area of 2.8777 square inches which is smaller than the 2.95 square inch maximum.

Vent duct wiring

Section 3020 causes numerous arguments; and it is sometimes difficult to comply with this section in every respect. It deserves more attention and study by contractors. A better understanding of this section could save expensive rejects from inspection authorities. The section in its entirity states:

(Continued on page 122)

Questions on the Code

(Readers are invited to send in questions which they would like to see discussed in this department.)

Limitations on link fuse use

QUESTION: Is the link fuse referred to in section 2471 a special kind of cartridge fuse? Why is it limited to sizes greater than 600 amperes and then only by special permission?

ANSWER: No, link fuses are not cartridge fuses. The cartridge fuse got its name from the cartridge-shaped shell or enclosure which contains the arc and, together with the fill, prevents damage to adjacent equipment and persons when heavy currents are interrupted.

The link fuse has no arc-snuffing qualities and no integral protective shell, although outer coverings are sometimes placed over and around the link. Years ago, fuse wire of various ratings was used to span a short space between two terminals for branch circuit protection. These were link fuses. Some link fuses were factory made out of such wire in various sizes with an open slot at each end to slide underneath terminal screws. These were used in panels for branch circuit protection and in junction boxes where wire sizes were reduced.

Today, link fuses are still to be seen occasionally on very old switchgear in the shape of thin buses. Sometimes several are paralleled and form a short section of the bus.

Now, link fuses are no longer permitted except in sizes greater than 600 amperes because much safer fuses are available as well as a wide selection of circuit breakers. The large pressure-type switches, which are a comparatively recent innovation, used link fuses which were shaped similar to small open-end wrenches. These switches are still available with this type fuse. However, since excellent fuses with the cartridge-type shells are now available in sizes greater than 600 amperes, very few inspectors will accept the link fuse.

I predict that the link fuse will not be permitted very much longer in any size. They are not nearly so safe as the far better and very high - interrupting - capacity type fuses which are now made to fit the pressure-type switches as well as other switches and fuse holders.

Special permission is required before link fuses can be used because of the inherent danger in their use. To interrupt the high short-circuit currents of today in a safe manner is a feat quite beyond the capabilities of the old-fashioned link fuse. These currents and the interrupting devices needed for them have been discussed in earlier issues of ELECTRICAL SOUTH in the series of articles entitled "Understanding The Code."

Locked switch use for lighting units

QUESTION: Are lighting fixtures required to have switches within sight of the fixtures unless the switches are capable of being locked in the open position? I installed fluorescent fixtures in an office which are controlled from a panel in a hallway out of sight. The Inspector said the switches had to be of the locked type or be within sight. He quoted section 4192 which *does* say that, but I never heard of it before except on motors and signs. Is this a new requirement?

ANSWER: A small but very important detail apparently was overlooked by you and by the inspector while reading section 4192. Neither of you seem to have read the *heading* which is: "Special Provisions for Electric Discharge Lighting Systems of More Than 1,000 Volts." As I have mentioned several times before, inattention to headings is a common mistake which happens to all of us. Headings are very important to the

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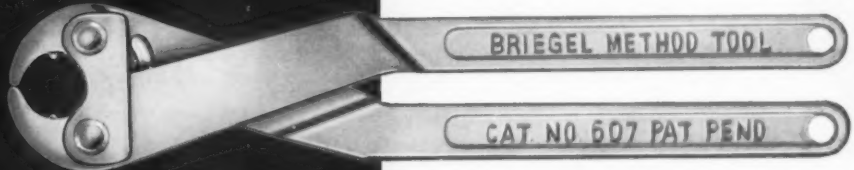

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meaning of the sections which follow them. But occasionally we all overlook them—sometimes to our sorrow.

Basis for motor circuit capacity

QUESTION: I know that the Code requires a branch circuit conductor to have a carrying capacity equal to 125% of the motor running current. But I have just read where the motor current in a delta wound motor must be multiplied by 1.732 to get the line current. Is this true? Specifically, would a delta wound motor rated at 24 amperes have a line current of 42 amperes (24 x 1.732)? And if so, would this still have to be multiplied by 125%?

ANSWER: No. Motor full-load running currents, as stamped on motor name plates, always indicate the terminal current for each terminal. Tables 21, 22, 23, and 24 of the Code also indicate average terminal currents. This current can be multiplied by 1.25 and the wire size corresponding to this value can be selected from Table 1. Or instead of multiplying by 1.25, the listed current can be used to select the wire size directly by using Table 20.

For selecting feeder sizes for supplying a group of motors, the largest motor is multiplied by 1.25, the remaining motor currents are added to this, and this total is used to select the feeder size from Table 1.

It is true that all delta windings, whether motors, generators, or transformers, have a current value of approximately 57.732 per cent of the line current value. Or, stated in the reverse order, the line current is 1.732 times greater than that of the winding. But a motor with a running current of 24 amperes has a line current of this value and a winding current of approximately 13.8 amperes. It does *not* have a winding current of 24 amps and a line current of 42 amps. The wireman seldom knows whether the motor is delta-connected or wye-connected; and for selecting wire sizes, it is not necessary to know.

It would be equally wrong to assume that a wye-connected motor rated at 220 volts had a line voltage of 220 x 1.732 or 381 volts. The voltage has the same relationship in wye-connected windings as the current has in delta-connected windings. Terminal voltages as well as terminal currents are always listed by Code tables and by motor name plates. See accompanying drawing.

Further comment on ground rod use

IN A RECENT article of the series on "Understanding the Code" the use of "made electrodes" for grounding was discussed with regard to their application in connection with the grounding of interior wiring systems. The editors are reminded by an experienced manufacturer in this field, that millions of ground rods, or "made electrodes," are being sold to power companies, telephone systems, railroads, and others throughout the world to provide adequate grounding of electrical systems and equipment.

Following are comments received from A. R. Teifeld, of Copperweld Steel Co., Pittsburgh, on the article mentioned above:

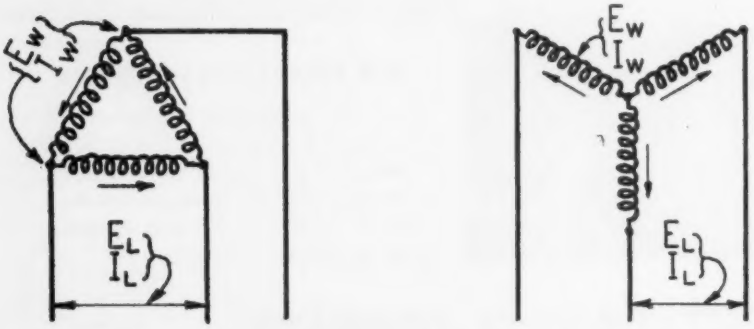
"In the article 'Understanding the Code' by Walter R. Stone that was published in the March 1959 issue of ELECTRICAL SOUTH, a statement is included relative to 'made' ground electrodes, which, in our opinion, is not in accord with general usage and practical experience. This statement is on page 84 in the right-hand column under the caption 'Electrode resistance to earth' and reads as follows: 'As a general rule, made electrodes are very poor grounding electrodes, especially in dry rocky soils.'

"Although Mr. Stone has qualified this remark with the words 'especially in dry rocky soils,' the inference that this sentence carries is certainly not factual. Speaking for the Copperweld Steel Company, which has been a producer of Copperweld ground rods for over 40 years, millions of these electrodes have been produced and installed in all types of soil throughout the United States and other countries of the world. There has never been any indication that these rods have been found to be 'very poor grounding electrodes.'

"Admittedly, in certain types of soil, driven ground electrodes do not provide low resistance grounds. The same would be true with other types of grounding electrodes. For example, in certain sandy soils and in locations where underlying rock strata is covered with a thin layer of soil, even an extensive metallic water piping system could conceivably not give a good ground. The only advantage it would have is in its widely distributed contact with a tremendous volume of earth.

"The resistance of a ground connection depends on the resistivity of the surrounding soil and in areas where the soil resistivity is high, it is sometimes difficult to obtain a low resistance ground under any circumstances. However, the driven ground electrode has many advantages practically and economically. In many cases, where a single driven rod does not provide sufficiently low resistance, additional rods can be driven and connected in multiple to lower the resistance by a substantial amount.

"There are other locations where deep driven electrodes using sectional type ground rods provide a means of reaching the better conducting soils which often lie at a considerable depth. The use of multiple rods or deep driven grounds provides a more practical and economical solution for obtaining a good ground than many other methods."



Motors are rated in terminal values so that current ratings and voltage ratings are those existing at motor terminals regardless of whether the winding is delta connected or wye connected. In the delta winding at left, the line current is 1.732 times the current in the winding while voltage across line wires is same as voltage across each winding phase. In the wye connected winding at right, the line current is the same as the winding current, but the voltage across the lines is 1.732 times the voltage across each winding phase.

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Flash-proof all around the joint and between the wires, too!

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Actually Triple-Safe

1. "Wrap-Cap" Insulators are virtually puncture-proof, with *extra-thick* protection over wire ends.
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Find out how much better a crimp connector can be. Get a supply of IDEAL "Wrap-Caps" today from your IDEAL Distributor—or mail the coupon for data.

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Listed as pressure cable connectors for general use (600 V.) in branch circuit and fixture wiring.

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New, revised estimating tables continued in this issue

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

STD. ENCLOSURE SWITCHES FUSELESS DISCONNECT
2-POLE "AC"

AMPERE SIZE	REWORK HRS. EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
30	1.9	2.38	2.85	3.33	3.80	4.28	4.75	5.23	5.70	6.18	6.65	7.13
60	2.5	3.13	3.75	4.38	5.00	5.63	6.25	6.88	7.50	8.13	8.75	9.38
100	4.4	5.50	6.60	7.70	8.80	9.90	11.00	12.10	13.20	14.30	15.40	16.50
200	6.9	8.63	10.35	12.08	13.80	15.53	17.25	18.98	20.70	22.43	24.15	25.88
400	9.0	11.25	13.50	15.75	18.00	20.25	22.50	24.75	27.00	29.25	31.50	33.75
600	13.5	16.88	20.25	23.63	27.00	30.38	33.75	37.13	40.50	43.88	47.25	50.63
		3 POLE										
30	2.5	3.13	3.75	4.38	5.00	5.63	6.25	6.88	7.50	8.13	8.75	9.38
60	3.1	3.88	4.65	5.43	6.20	6.98	7.75	8.53	9.30	10.08	10.85	11.63
100	5.4	6.75	8.10	9.45	10.80	12.15	13.50	14.85	16.20	17.55	18.90	20.25
200	8.4	10.50	12.60	14.70	16.80	18.90	21.00	23.10	25.20	27.30	29.40	31.50
400	11.0	13.75	16.50	19.25	22.00	24.75	27.50	30.25	33.00	35.75	38.50	41.25
600	16.4	20.50	24.60	28.70	32.80	36.90	41.00	45.10	49.20	53.30	57.40	61.50
		4 POLE										
30	2.8	3.50	4.20	4.90	5.60	6.30	7.00	7.70	8.40	9.10	9.80	10.50
60	3.6	4.50	5.40	6.30	7.20	8.10	9.00	9.90	10.80	11.70	12.60	13.50
100	6.2	7.75	9.30	10.85	12.40	13.95	15.50	17.05	18.60	20.15	21.70	23.25
200	9.6	12.00	14.40	16.80	19.20	21.60	24.00	26.40	28.80	31.20	33.60	36.00
400	12.6	15.75	18.90	22.05	25.20	28.35	31.50	34.65	37.80	40.95	44.10	47.25
600	18.8	23.50	28.20	32.90	37.60	42.30	47.00	51.70	56.40	61.10	65.80	70.50

E-103-B

LABOR: Includes drilling of anchor holes, setting abchors or screws, installation of switch and connecting conductors.

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SWITCHES MAIN DISCONNECT "DC" STD. ENCLOSURE 2 P — D.C. — 250 V

NEW WORK

AMP. SIZE	HRS. EACH	LABOR COST EACH INSTALLED AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
30	1.6	2.00	2.40	2.80	3.20	3.60	4.00	4.40	4.80	5.20	5.60	6.00
60	1.9	2.38	2.85	3.33	3.80	4.28	4.75	5.23	5.70	6.18	6.65	7.13
100	3.5	4.38	5.25	6.13	7.00	7.88	8.75	9.63	10.50	11.38	12.25	12.99
200	5.4	6.75	8.10	9.45	10.80	12.15	13.50	14.85	16.20	17.55	18.90	20.25
400	7.	8.75	10.50	12.25	14.00	15.75	17.50	19.25	21.00	22.75	24.50	26.25
600	10.9	13.63	16.35	19.08	21.80	24.53	27.25	29.98	32.70	35.43	38.15	40.88
REWORK JOBS												
30	1.8	2.75	2.70	3.15	3.60	4.05	4.50	4.95	5.40	5.85	6.30	6.75
60	2.3	2.88	3.45	4.03	4.60	5.18	5.75	6.33	6.90	7.48	8.05	8.63
100	4.1	5.13	6.15	7.18	8.20	9.23	10.25	11.28	12.30	13.33	14.35	15.38
200	6.4	8.00	9.60	11.20	12.80	14.40	16.00	17.60	19.20	20.80	22.40	24.00
400	8.3	10.38	12.45	14.53	16.60	18.68	20.75	22.83	24.90	26.98	29.05	31.13
600	12.5	15.63	18.75	21.88	25.00	28.13	31.25	34.38	37.50	40.63	43.75	46.88

E-101-B

LABOR: Includes drilling of anchor holes, setting anchors or screws, installation of switch and connecting conductors.

6-59

Electrical Estimating—III

MAGNETIC STARTING SWITCHES & STARTING BUTTONS

NEW WORK

110 VOLT - ACROSS LINE (1-2-3- PHASE)

H.P.	HOURS EA.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1	3.9	4.88	5.85	6.83	7.80	8.78	9.75	10.73	11.70	12.68	13.65	14.63
1½	4.7	5.88	7.05	8.23	9.40	10.58	11.75	12.93	14.10	15.28	16.45	17.63
3	6.1	7.63	9.15	10.68	12.20	13.73	15.25	16.78	18.30	19.83	21.35	22.88
7½	7.0	8.75	10.50	12.25	14.00	15.75	17.50	19.25	21.00	22.75	24.50	26.25
10	7.6	9.50	11.40	13.30	15.20	17.10	19.00	20.90	22.80	24.70	26.60	28.50
25	8.5	10.63	12.75	14.88	17.00	19.13	21.25	23.38	25.50	27.63	29.75	31.88
50	10.0	12.50	15.00	17.50	20.00	22.50	25.00	27.50	30.00	32.50	35.00	37.50
		220 VOLT "ACROSS THE LINE" 1-2-3- PHASE										
1½	3.4	4.25	5.10	5.95	6.80	7.65	8.50	9.35	10.20	11.05	11.90	12.75
2	4.2	5.25	6.30	7.35	8.40	9.45	10.50	11.55	12.60	13.65	14.70	15.75
3	4.7	5.88	7.05	8.23	9.40	10.58	11.75	12.93	14.10	15.28	16.45	17.63
5	5.3	6.63	7.95	9.28	10.60	11.93	13.25	14.58	15.90	17.23	18.55	19.88
7½	5.9	7.38	8.85	10.33	11.80	13.28	14.75	16.23	17.70	19.18	20.65	22.13
15	6.5	8.13	9.75	11.38	13.00	14.63	16.25	17.88	19.50	21.13	22.75	24.38
25	7.3	9.13	10.95	12.78	14.60	16.43	18.25	20.08	21.90	23.73	25.55	27.38
50	8.6	10.75	12.90	15.05	17.20	19.35	21.50	23.65	25.80	27.95	30.10	32.25
		440 VOLT "ACROSS THE LINE" 1-2-3- PHASE										
1½	3.0	3.75	4.50	5.25	6.00	6.75	7.50	8.25	9.00	9.75	10.50	11.25
2	3.5	4.38	5.25	6.13	7.00	7.88	8.75	9.63	10.50	11.38	12.25	13.13
5	4.7	5.88	7.05	8.23	9.40	10.58	11.75	12.93	14.10	15.28	16.45	17.63
7½	5.3	6.63	7.95	9.28	10.60	11.93	13.25	14.58	15.90	17.23	18.55	19.88
10	5.6	7.00	8.40	9.80	11.20	12.60	14.00	15.40	16.80	18.20	19.60	21.00
25	6.3	7.88	9.45	11.03	12.60	14.18	15.75	17.33	18.90	20.48	22.05	23.63
50	7.4	9.25	11.10	12.95	14.80	16.65	18.50	20.35	22.20	24.05	25.90	27.75

E-101-B

LABOR: INCLUDES DRILLING OF ANCHOR HOLES AND SETTING ANCHORS OR SCREWS, INSTALLATION OF SWITCH AND CONNECTING CONDUCTORS.

6-59

Electrical Estimating—III

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News of the industry

edited for Southern readers

Crouch addresses IES conference

ONE DETERRENT to developing reading skills in the younger generation was explained by C. L. Crouch, technical director of the Illuminating Engineering Society, at the IES regional conference for the Southeastern and Southcentral areas, held recently in Asheville, N. C.

Crouch said that studies have shown that unimproved lighting in schoolrooms is a considerably greater barrier to effective learning than was previously thought. He also said that scientific studies of highway lighting have shown that improved illumination is most important in reducing highway accidents.

At a luncheon meeting of the conference, C. S. Reed of Charlotte, vice president of Duke Power Co., discussed "Times Are Changing," pointing out how the Carolinas Piedmont is contributing to the product field.

At the meeting's closing banquet, awards were given the winners in the "My Most Interesting Lighting Job" contest. First prize winner in Class I, residential, was Mrs. Arthur D. Perkins, Stone Mountain, Ga. Mrs. Perkins is an employee of the Georgia Power Company, Atlanta, in their Sales Department's "Home Service." Her entry consisted of the lighting of her own new residence.

Winner in Class II, commercial, industrial, and other, was L. Ralph Bush, Bush-May and Associates, consulting engineers, Atlanta, Ga. His entry consisted of the floodlighting of the Georgia State Capitol building.

For the sixth time since 1950, the Georgia Section, IES, won the annual attendance award given to the section or chapter having the greatest registration at the conference in proportion to its official membership and also in proportion to the official AAA mileage between the conference city and the section or chapter city.

Alabama Power Company offers new pay plan

A NEW 12-MONTH average payment plan for electric service bills has been put into operation by the Alabama Power Company. Residential users of air-conditioning and/or electric heating equipment can take advantage of the program provided they reside in a single-family dwelling and have a bill of $30 or more for any one month.

The total of the customer's previous 12 months' bills is determined and he will be billed 1/11th of that amount each month for 11 months. Any difference between payments and the billing that exists at the end of the 11th month will be entered on his bill for the 12th month.

A new customer with good credit or one who is adding air conditioning and/or electric heating can qualify for the new program if the annual billing as estimated by a qualified company representative indicates that the customer will have a bill of $30 or more during the next 12 months.

Business failures at postwar high

"THE FAILURE RECORD Through 1958," a fifteen-page analysis of business failures in the United States, has just been published by Dun & Bradstreet, Inc. This annual study, prepared by the Business Economics Department of the credit reporting agency, covers business failures and resultant creditors' losses from 1920 through 1958. To round out the failure picture over this period, failures and creditors' losses are analyzed by location, by industry, by age, by size, and by cause.

According to the analysis, reflecting the impact of the recession, business failures in 1958 reached a new postwar high of 14,964 with liabilities of $728,000,000. However, the brunt of the economy's downturn was felt in the first half of the year when casualties climbed 14 per cent above the comparable period of 1957. Significantly, the increase slackened to 4 per cent in the last half of the year.

This downward trend has continued into the first quarter of 1959 with 3,697 businesses failing with resultant liabilities of $197,000,000. Percentagewise, this represents a decrease of 8 per cent in numbers and a decrease of 2 per cent in liabilities compared to the first quarter of 1958.

The number of failures and their total liabilities in the construction field increased each year from 1952 through 1958, but the percentage increase in 1958 was only 3 per cent as

LATEST STREETLIGHTING TECHNIQUES—George J. Taylor, president of the Illuminating Engineering Society, observes latest streetlighting techniques along with Henry J. Channon, manager of marketing at the General Electric Outdoor Lighting Dept., Hendersonville, N. C. The "Crossroads of Light" demonstration area on the plant grounds enables engineers to study effects of 30 different roadway illumination systems composed of filament, mercury, and fluorescent luminaires.

compared to an increase of nearly 15 per cent the year before. A slight decline in failures in 1958 from 1959 was recorded for subcontractors in the construction field.

Alabama Power Company names vice presidents

EDWARD R. COULBOURN, former engineering manager, and Douglas F. Elliott, former construction manager, were elected vice presidents of the Alabama Power Company recently. Mr. Coulbourn is vice president in charge of engineering and Mr. Elliott is vice president in charge of construction. They succeed F. C. Weiss who has retired and will become chairman of the group of consultants advising the company on various aspects of its construction program on the Coosa and Warrior Rivers.

Mr. Coulbourn came to the company in 1924 as office engineer-distribution. He became chief electrical engineer in 1944 and manager of engineering in 1951.

Mr. Elliott joined Alabama Power Company in 1924 as an apprentice engineer. He has held various posts with the company and was made construction manager in 1944.

St. Louis NECA group holds heating seminars

PROPER CONTROL is the most vital part of the entire electric heat installation," J. A. Rodgers, Jr., technical sales engineer for White-Rodgers Co., told members of the St. Louis Chapter of the National Electrical Contractors Association at their

J. A. Rodgers, Jr., explains the history, development, and operation of electric space heating controls to St. Louis NECA group.

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• As a final inspection—all Peerless Electric Fan and Blower products—large or small—are electronically tested and checked for balance under actual operating speeds. Corrections are made on the spot, when necessary. When shipped, the unit is in perfect dynamic balance. This is another Peerless Electric manufacturing function that produces a superior-quality product.

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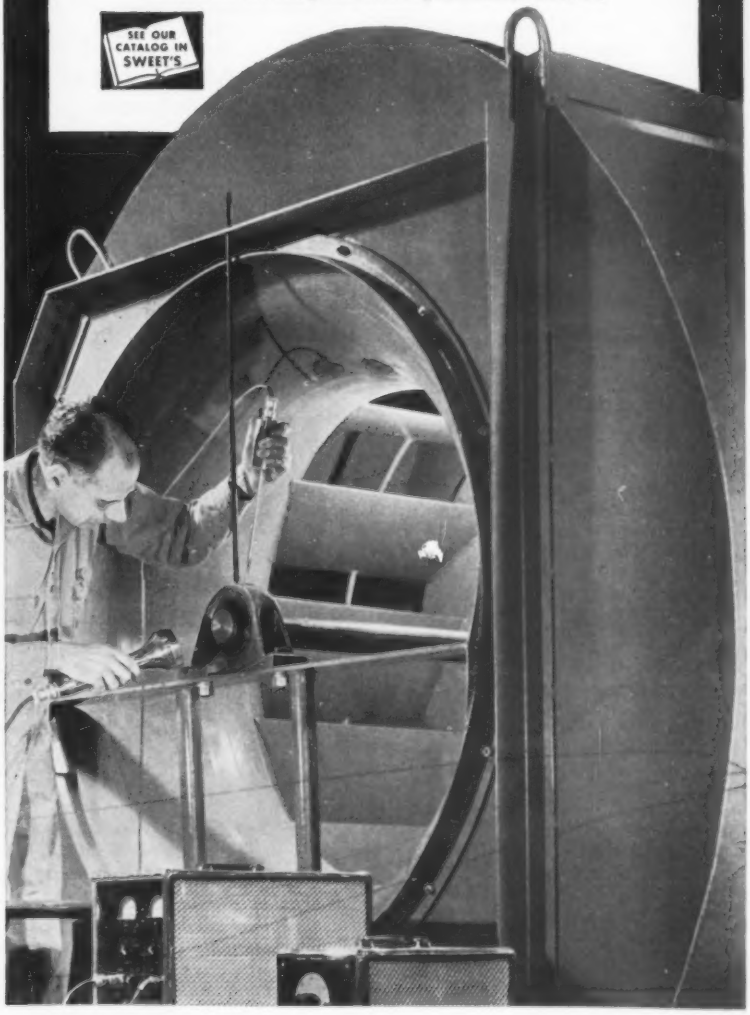

educational seminar held recently. Mr. Rodgers was the guest speaker at the sixth in a series of 12 weekly seminars on control, application, and selling technique of electric heat, held as part of the St. Louis group's member educational program.

Meetings covered electric heating in residential, commercial, institutional, and industrial fields. They were designed as a pilot course for possible use by the 140-group NECA national association.

Following Mr. Rodgers, Dr. Preston McNall, research director of Minneapolis - Honeywell, and Wayne Stout, field representative for the company, also spoke to the group.

The seminar series was originated by Col. C. P. Bobe, chairman of the Research and Education Committee for both the national and St. Louis NECA groups. Meeting space, materials, and speakers are furnished by Union Electric Company, St. Louis utility.

Officers elected at annual U.L. meeting

AT THE ANNUAL meeting of Underwriters' Laboratories, Inc., Clarke Smith, U. S. Manager, Royal Insurance Co., Ltd., was elected chairman of the board to replace C. W. Ohlsen, retired. Merwin Brandon was elected president to replace Curtis R. Welborn, retired. Lester S. Harvey, president, New Hampshire Fire Insurance Co., and W. L. Nolen, U. S. Manager, North British and Mercantile Insurance Co., Ltd., were elected trustees of the board replacing C. W. Ohlsen and H. A. Clark, retired.

Mr. Brandon joined the staff of Underwriters' Laboratories, Inc., in 1921 as an assistant engineer of the Gases and Oils Department, in Chicago. In 1922 he became a member of the Label Service Department, and in May 1928 he was promoted to associate electrical engineer in the New York office. In July 1945, he was appointed electrical engineer and in April 1948 he was elected vice-president of the corporation. He is a Fellow of the AIEE and chairman of the Electrical Section of NFPA.

Georgia Power Company announces appointments

GEORGIA POWER Company, Atlanta, Ga., has announced the appointment of Temp S. Davis, Jr., assistant Atlanta division manager, to succeed Edwin M. Clapp as vice-president in charge of the Columbus division upon Mr. Clapp's retirement September 1.

Appointments of three Georgia Power officials to newly created posts of division managers have also been announced. H. G. Moore, former assistant division manager, Atlanta; Muse E. Mann, former assistant division manager, Columbus; and J. E. Wiatt, former division superintendent, Macon, were named division managers in their respective divisions to fill the new posts.

Mr. Davis joined the company in 1934, as an Atlanta division lighting engineer. He held various positions in Atlanta, Augusta, and Rome, and in 1957 he was named assistant Atlanta division manager.

FAEC convention date set for October

PLANS have been announced for the 1959 Florida Association of Electrical Contractors Convention and 7th Electrical Trade Show. The Robert Meyer Hotel, Jacksonville, Fla., will be headquarters for the convention and show to be held October 7-10.

FAEC exhibits will be devoted exclusively to materials, supplies, and equipment that are of particular interest to FAEC members. A selected list of manufacturers and suppliers are being invited to exhibit. Fifty-five booths will be available, and they will be allocated on a first-come, first-serve basis.

Reynolds announces new appointment

REYNOLDS METALS Company has announced the addition of an electrical conductor specialist to its industrial market staff in Houston, Texas. William H. Anderson was named to the new position, with headquarters in the aluminum firm's office at 6910 Fannin. He will work with electrical utilities and industries in a 40-county southeast Texas area in applications of aluminum conductor and conduit.

Mr. Anderson formerly was sales manager of an electric construction company in Houston and previously had been with Houston Lighting and Power Company.

Reynolds has established the new position in its Houston office because of the growing use of aluminum in electrical applications in this area.

Penn-Union appoints new sales manager

LESTER R. CRANE, vice president of sales for Penn-Union Electric Corp., Erie, Pa., as part of the continued expansion program announces the appointment of Clifford J. Ortmeyer

C. J. Ortmeyer

as sales manager for utility products.

Mr. Ortmeyer entered the electrical industry upon the completion of his military service as aviation electrician of instruments. For seven years he was associated with another large

NEW STREET LIGHTING SYSTEM—A new mercury-vapor lighting system in the retail shopping area is an improvement designed to help Kingsport, Tenn., grow and prosper. Installed were 210 luminaires manufactured by Line Material Industries. The new fixtures are connected to 6.6-ampere series and 240-volt multiple circuits. Residents have expressed great satisfaction with the lighting system.

connector manufacturer, first in the development and design department of engineering, then in the sales department as sales application engineer for utility and distributor products.

Manufacturers appoint new representatives

BROOKSIDE Manufacturing, Inc., Boston 30, Mass., announces the appointment of four new Southern representatives for their line of electrical insulating tapes. Barber A. Ayers & Associates, 1705 W. Lee St., Greensboro, N. C., will represent the company in Virginia and North Carolina. The Texas and Oklahoma territory will be covered by Burrus and Matthews, 2810 Canton St., Dallas, Texas. Hopper and McCoy, Inc., 870 Northside Dr., NW, Aaltnta, Ga., will be the Brookside agent in Georgia, Alabama, South Carolina, and part of Mississippi. In the St. Louis area, the Ajax Electrical Sales Co., 1824 South 18th St., St. Louis, will represent the company.

* * *

BOB PINNS, of Miami, has been appointed representative for the Tri Tap Tool and Supply Co., Carlsbad, Calif., in the Southeastern area bounded by the Mississippi River and the Mason Dixon Line. Mr. Pinns has his headquarters and warehouse at 335 N.E. 93rd St., Miami Shores, Fla.

* * *

WAYNE JOHNSON is now a representative for ESCO Manufacturing Co., Greenville, Texas. His territory is the state of Georgia, and his headquarters are in Moultrie. The company has recently set up a warehouse stock of ESCO distribution capacity transformers in Atlanta in order to serve the entire state with overnight shipment.

Wayne Johnson

* * *

UTILITY TRANSFORMER and Equipment Co., Baraboo, Wis., has announced the appointment of several new factory sales representatives to their organization. J. E. House, Motors Variable Speed Sales Co., 3011 San Jacinto St., Houston 4, Texas, will cover the state of Texas exclusive of El Paso County. El Paso County and the state of New Mexico will be the territory of Marshall R. Elmore and Co., 1011 Richard St., Carlsbad, N.M. In Arkansas, Louisiana, Mississippi, and Oklahoma, the company will be represented by Chester Butt, P.O. Box 8213, Houston 4, Texas.

* * *

DOSSERT Manufacturing Corp., Brooklyn, N.Y., has appointed Barber A. Ayers and Associates, 1705 W. Lee St., Greensboro, N.C., as their representative in the state of North Carolina.

* * *

CHARLES "BUD" TORNOW, Miami, Fla., has been appointed the representative for Ideal Industries, Inc., Sycamore, Ill. Mr. Tornow will have as his territory the state of Florida.

Kuhlman announces new sales positions

KUHLMAN ELECTRIC Company of Birmingham, Mich., announces two newly-created sales positions. Robert J. Farr is appointed manager of sales services and M. M. Lindamood is product manager.

Mr. Farr will head inventory control, pricing, and marketing statistics. Mr. Lindamood, acting as liaison between sales and engineering, will manage sales training and customer product information.

The appointment of Farr and Lindamood will strengthen Kuhlman's headquarter sales staff control and help effectively control the company's national and regional sales organization.

HEAT PUMPS GAIN POPULARITY—From left to right, Sam George, vice-president, Sunstate Sales Corp., Nelson Thayer, general manager of Heating and Air Conditioning Division, Sunstate Sales Corp., and Ed Spivey, district representative, Heating and Air Conditioning Division, General Electric Co., look over a trailer load of newly arrived General Electric "Weathertron" heat pumps. These heat pumps are already earmarked for installation in the Tampa area where this type of heating system is gaining in popularity. In 1958, for example, 601 units were installed as compared to 401 in 1957 and 221 in 1956.

I-T-E names Caldwell to new position

THE *I-T-E* Circuit Breaker Co., Philadelphia, Pa., has announced the appointment of Walter S. Caldwell to a newly created position of utility apparatus engineer for the company's southern sales region.

W. S. Caldwell

This is a newly-created position in which Caldwell will function as a

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EMT set screw fittings
ONLY ONE SET-SCREW TO TIGHTEN.
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The editorial and business staff of ELECTRICAL SOUTH is eager to serve you. One way in which we can help you is to make it easy for you to draw upon the wealth of technical and promotional material available from manufacturers.

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Check over the list of publications available, indicate the numbers of the ones you want on the postage-paid card to be found on page 19, and mail it to us with your name, title, company and address plainly written. We will tell each manufacturer to send directly to you the information you want.

product specialist for utility customers.

Caldwell will be headquartered at the company's southern regional office, 1401 Peachtree St. Atlanta, Ga. He will service the I-T-E ten-state southern sales region, including North and South Carolina, Georgia, Florida, Alabama, Arkansas, Mississippi, Tennessee, Texas, and Louisiana.

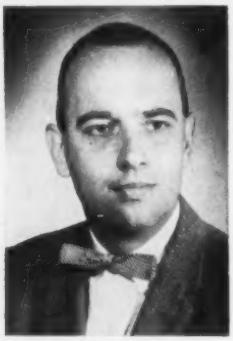
Men moving up in the industry

AT A RECENT MEETING of Southern States Equipment Corporation stockholders, T. A. Burdeshaw, vice-president-engineering was elected to the board of directors.

Mr. Burdeshaw has been with Southern States for 18 years and has served in various executive positions prior to being elected a vice-president in 1957.

* * *

ROBERT L. REESE has been named to the position of manager, product development by Hubbard and Company. He was formerly their chief engineer,



Robert L. Reese

Andrew C. Verock

pole line hardware. In his new assignment, Mr. Reese will be headquartered in the Chicago home office of the company.

Andrew C. Verock has been appointed chief engineer, pole line hardware to replace Mr. Reese. Mr. Verock will operate out of the new Hubbard research laboratory in McCook, Ill.

* * *

GEORGE USTIN has been named to the newly-created post of vice president in charge of engineering at Buchanan Electrical Products Corp., Hillside, N.J.

Mr. Ustin will be responsible for coordinating and expanding product engineering, research, and development with the company's over-all sales growth.

* * *

SANGAMO Electric Company has appointed Hugh W. Griffith, Jr., to the

Dates Ahead

American Institute of Electrical Engineers, Summer and Pacific General Meeting, Seattle, Wash., June 22-26, 1959.

Illuminating Engineering Society, National Technical Conference, Mark Hopkins Hotel, San Francisco, Calif., Sept. 7-11, 1959.

Edison Electric Institute, Meter and Service Committee Meeting, Wentworth - by - the - Sea, Portsmouth, N. H., Sept. 14-16, 1959.

Public Utilities Association of the Virginias, Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., Sept. 17-20, 1959.

Edison Electric Institute, Transmission and Distribution Committee Meeting, Rice Hotel, Houston, Texas, Oct. 1-2, 1959.

Florida Association of Electrical Contractors, Convention and 7th Annual Trade Show, The Robert Meyer Hotel, Jacksonville, Fla., Oct. 7-10, 1959.

International Association of Electrical Inspectors, Southern Section, 31st Annual Meeting, Heidelberg Hotel, Jackson, Miss., Oct. 12-14, 1959.

American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill., Oct. 12-16, 1959.

Power Distribution Conference, Dept. of Electrical Engineering, University of Texas, Austin, Texas, Oct. 26-28, 1959.

new position of sales manager, power equipment, to direct the efforts of the outside sales organization for

H. W. Griffith

power equipment. He is responsible to James H. Patton, vice president, manager, power equipment.

Brief news notes of manufacturers

COPPERWELD Steel Company's Wire and Cable Division, Glassport, Pa., has received an award from the Smithsonian Astrophysical Observatory for its support of the Moonwatch Project, Satellite Optical Tracking Program. Copperweld's Wire & Cable Division aided the Pittsburgh Moonwatch group by giving technical advice on the proper guying of the meridian pole at the Allegheny Observatory station and by furnishing the necessary guy strand for the project.

* * *

THE NEW PLANT of the Wakefield Southwest Co., now under construction at 3745 N.W. 37th St. Place in the Willow Springs Industrial District, Oklahoma City, Okla., will provide a regional sales office and the facilities for assembly, warehousing, and distribution to the Southwest of Wakefield industrial and commercial lighting equipment. Joseph E. Comer, vice president, is in charge of the Oklahoma operation.

* * *

JAMES R. KEARNEY Corporation has merged with Electrical Industries, Inc., an affiliate of the Dyson Corporation. Charles H. Dyson, president of both the Dyson Corporation and Electrical Industries, Inc., said the surviving company of the merger will continue under the name James R. Kearney Corporation.

The Dyson Corporation also owns Hubbard and Company. It is understood that Kearney Corporation and Hubbard will continue to operate as two separate organizations.

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AUTOMATIC ELECTRIC HEAT
has NO MOVING PARTS

TROUBLE-FREE
no maintenance cost
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no lubrication problems
no motors
no servicing cost
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no filters
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Cavalier automatic electric heat can normally be installed at lower cost than any other automatic heating system.

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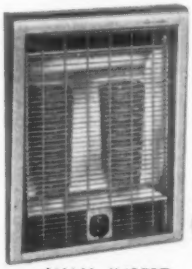
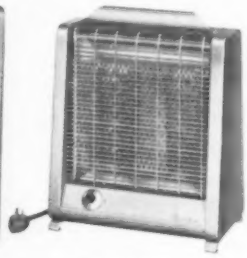
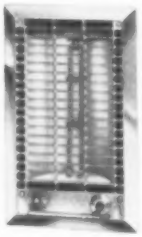


WALL INSERT
1 to 5 KW



PORTABLE
2, 3, 4 KW



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Automatic and non-automatic
115 and 230 volt

Also available: FLOOR FURNACE and CABLE HEAT

FIRST
in quality construction
in engineering advances
in safety
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HEAT BETTER ELECTRICALLY

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CAVALIER CORPORATION
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Over 90 Years of Quality Products

THE NEW IDEAS NOW COME IN A NEW BLUE BOX

The box that brings you Blackhawk's full line of electrical fittings and holding devices, specialties and tools. Look for Blackhawk's new, blue box at wholesalers everywhere.

FITTINGS
A complete line of highest quality electrical fittings for use with rigid conduit, EMT, Service Entrance Cable, Non-Metallic Sheathed Cable and Portable Cords; the original Snap-Strap and the original Slip Fitter Entrance Head.

SERVICE ENTRANCE MAST ASSEMBLY AND ACCESSORIES
Service Entrance Mast, available for 2" or 2½" pipe; Adustable Bar Hanger; Beam Clamps; Conduit Hanger; Offset Reducer; Slip Fitter Head; The original Neoprene Synroflashing Unit; Mounting Brackets; Insulators.

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Two high strength steel clad wireholders; a medium duty and small dimension leaded type wireholder.

SPECIALTIES, TOOLS
Screw Drivers, Chisels, Awls; Steel and Brass Wood and Machine Screws. Fish tapes, Anchoring devices.

PLUS — Ground Clamps, Sill Plates, Sharp Point Staples, Pole Ground Assemblies, and many specialties.

Immediate delivery from adequate stocks to electrical wholesalers only. Write today for Blackhawk's complete catalog of electrical fittings and specialties.

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where the new ideas come from

R. A. Hinshaw

R. P. Thompson

R. H. Earle

L-M announces recent promotions

RALPH H. EARLE has been named manager of engineering development for Line Material Industries. In connection with this change two personnel promotions have been announced for the engineering department.

Robert P. Thompson has been promoted from manager of engineering —transformers, to manager of central engineering and research. Robert A. Hinshaw, who was Thompson's assistant, will take over as manager of engineering—transformers.

Mr. Earle joined the company in 1929 and has held the positions of research engineer, director of research, chief engineer, and more recently manager of engineering development—general products.

Mr. Thompson joined L-M in 1941, and since that time has held several positions in transformer engineering.

Mr. Hinshaw joined the company in 1952. Before joining Line Material he held positions in the fields of research and teaching.

Technical books

for the electrical man

Radio engineering

"Radio Engineering Handbook," Fifth Edition, Keith Henney, Editor-in-Chief. Published by McGraw-Hill Publishing Co., 327 W. 41st St., New York 36, N. Y., 1800 pages, illustrated, $25.00.

This new Fifth Edition of the "Henney" handbook supplies quick answers to an exceptionally broad range of radio engineering problems. In it a staff of experts provides working principles, standards, and procedures which are most needed in every major branch of radio. Communications, broadcasting, television, navigation aids, facsimile, aircraft radio, and other radio fields are covered.

This revised Fifth Edition reflects the many advances and developments in radio. While retaining the same useful method of arrangement and practical approach.

For example, new chapters have been added on diodes, high-frequency tubes, transistors, nonlinear circuits, high-frequency measurements, radio transmitters, wire telegraphy, and wire telephony. Chapters covering such topics as resistance, audio-frequency circuits, oscillators, power supplies, propagation, facsimile, and navigation aids have been rewritten and updated.

Radio Engineering Handbook is designed to meet the needs of practicing engineers in solving both routine and special problems. In addition to providing a wealth of descriptive information, the book contains hundreds of charts, tables, circuit diagrams, and schematic drawings.

Loading transformers

"Guide for Loading Oil-Immersed Distribution and Power Transformers." Published by the American Standards Association, 70 East 45th St., New York 17, N. Y., $2.00.

The guide, C57.92, is an appendix to the C57.12 series of standards, American Standard Power and Distribution Transformers, revised and published last year.

The guide is published to facilitate the use of the American Standard, and is not a part of the standard. It covers general recommendations for loading all types of oil-immersed transformers, except water-cooled transformers built before 1929.

The transformers covered by the

guide may use either oil or synthetic fluids in combination with cellulose insulations. Such transformers are usually specified to have an average rise of not more than 55 C and hot-test-spot winding rise of not more than 65 C at rated load.

Sound systems

"The Audio Cyclopedia," by Howard W. Tremaine. Published by Howard W. Sams and Co., 2201 East 46th St., Indianapolis 6, Ind., 1280 pages, illustrated, $19.95.

Covering every phase of audio, including latest data on stereo, this 1,280 page volume contains answers to more than 3,400 separate questions on audio. Any audio subject can be easily found from the 54-page index by means of a unique chapter and paragraph numbering system.

The author has attempted to compile sufficient data in one book, in the form of questions and answers, to synthesize sound systems generally, together with their components and allied equipment and the accepted methods of installation, testing, and operation. The book contains 26 sections which cover everything from basic principles of sound through methods of recording and reproduction, magnetic and optical film recording, motion picture projection equipment, test equipment, installation techniques, general information, charts and tables, etc.

Transistors

"ABC's of Transistors." Published by Howard W. Sams and Co., Inc., 2201 East 46th St., Indianapolis 6, Ind., 96 pages, $1.25.

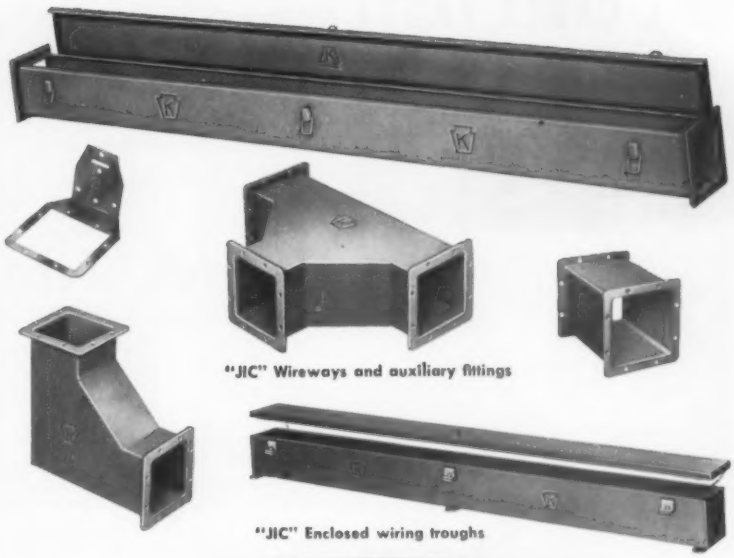
Here is a book giving the structure and function of the transistor in easy-to-understand terms. It describes the basic circuits in which transistors are used—easy methods for determining the correct polarity of voltages.

The book is filled with useable and practical information as it applies to the servicing and testing procedures. All of this information is written to give the technician the understanding needed to service modern transistor equipment.

Rectifying devices

"International Rectifier Corporation Engineering Handbook." Published by International Rectifier Corp., El Segundo, Calif., 128 pages, illustrated, $1.50.

The handbook contains a combination of theoretical and practical articles on the application of rectifying devices for today's electronic and electrical equipment. It is compiled for the use of design engineers. As each new development appeared in this field, International Rectifier



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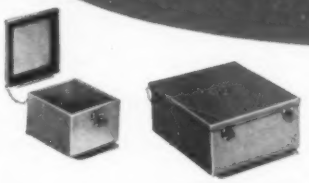
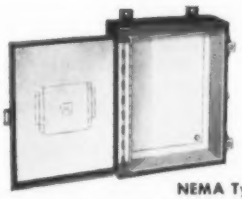
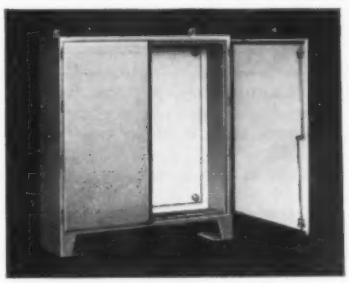

"JIC" Terminal and Pull Box Enclosures

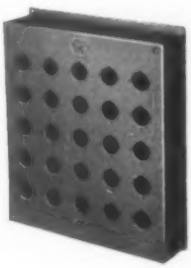
Keystone now offers a complete line of "JIC" wiring enclosures designed to provide positive, sealed protection against dust, dirt, oil, water and coolants! You'll find liquid-tight wireways, fittings, troughs, boxes and cabinets in a wide range of sizes to meet your exact needs—all produced to the electrical specifications of the Joint Industry Conference Standards.

What's more, when you *want* an item, you *get* it—*fast*—from large stocks maintained at both factory and regional warehouses! In addition, Keystone offers a complete design and build service for producing custom enclosures to fulfill your special requirements!


NEMA Type 12—"JIC" Control Panel Enclosures



Oil-Tight Pushbutton Enclosures



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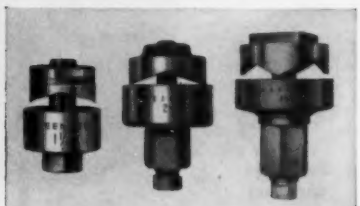
through open or concealed conduit

Greenlee Cable Puller

Pull large-size cable at any angle, from any convenient location with a No. 765 Cable Puller. Use it for exposed or concealed conduit . . . high up, in close quarters, or out in the open. This powerful tool can be hand- or power-operated . . . exerts a maximum pull of 7,500 pounds and has two operating speeds . . . one for fast work, the other for a steadier, heavy pull. At all times the pull is in line with the conduit . . . no strain on the hangers. See your electrical distributor for this timesaving equipment, or write for literature.

Cut conduit holes quickly, easily with Greenlee Knockout Punches



Complete range of punches to make openings for all standard conduit sizes ½" - 5". Fast, easy cutting through 10-gauge metal. Hand, ratchet, or hydraulic driver operated. Wide choice of sets.

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Corporation's engineering staff wrote articles that give a background for the use of the new devices. Many of the articles were prepared for and appeared in leading technical journals.

The handbook is divided into four sections: Theory: Application Data—Selenium, Silicon, Germanium Rectifiers; Sener Voltage Regulators; Photocells and Sun Batteries. Included in the book is a special index to International Rectifier Corporation semiconductor types.

Helpful literature

available to our readers

Electric Tube Products, Inc., 74-16 Grand Ave., Maspeth, N. Y., announces the availability of a new bulletin describing their line of **electrical fittings.** The illustrated brochure contains catalog information, specifications, and shipping data.

Write B-615 on reply card, page 19.

Automatic **reclosing protection** for 23- to 46-kv circuits is described in a new technical bulletin published by Greensburg Division of **I-T-E Circuit Breaker Co.,** Philadelphia, Pa.

The 12-page bulletin illustrates and describes the line of Type HVR reclosers—23, 34.5, and 46 kv sizes with continuous-current ratings of 100, 140, 200, 280, and 400 amperes.

Write B-616 on reply card, page 19.

Crouse-Hinds Co., Syracuse 1, N. Y., has announced a 48-page bulletin "ARK-trol Electrical Connectors," describing a complete new line of **plugs and receptacles** in environment-resistant construction.

Type RPE environmental ARK-trol connectors are moisture-proof, shock-insulated, dust-tight, and corrosion-resistant. Type RPC circuit-breaking ARK-trol connectors have all the features of RPE plus ability to break circuits under full rated load.

Write B-617 on reply card, page 19.

A new bulletin available from **Spring City Electrical Mfg. Co.,** Spring City 25, Pa., includes a line of **weathertight pole bases.** Illustrations of bases with several types of covers are included. In addition to lighting applications, they are used for mounting of signs, police call or fire boxes, traffic signals, and electrical enclosures.

Write B-618 on reply card, page 19.

Information describing its line of Tranfo-Units—completely packaged, compact **unit substations**—is furnished in a new bulletin published by **I-T-E Circuit Breaker Co.,** Philadelphia, Pa.

The 16-page, two-color bulletin provides basic design, application, and specification information to aid application engineers and consultants in selecting integrated combinations of equipment.

Write B-619 on reply card, page 19.

A new 8-page, 2-color bulletin describes the complete line of **high-voltage starters** manufactured by the **Electric Controller & Mfg. Co.,** Division of Square D Co., 4500 Lee Rd., Cleveland 28, Ohio.

The new bulletin covers starters for squirrel cage, wound rotor, and synchronous motors, in both air-break and oil-break forms, for use on 2200 to 4800-volt systems.

Write B-620 on reply card, page 19.

New pocket-sized **application procedure** booklet containing complete instructions for the installation of Preformed splices on messenger strands, guy strands, ground wires, and open line wires is now available from **Preformed Line Products Co.,** 5349 St. Clair Ave., Cleveland 3, Ohio.

Write B-621 on reply card, page 19.

A new booklet "Convenient Tables and Formulas" has been published by **Westinghouse Electric Corp.,** P. O. Box 2278, Pittsburgh 30, Pa.

The book includes 120 pages of convenient **tables, formulas,** and graphical symbols summarizing electrical data, properties of materials, heat transfer and steam information, measurements, and other subjects.

Write B-622 on reply card, page 19.

A new bulletin available from **Sorgel Electric Co.,** 838 National Ave., Milwaukee 4, Wis., describes their line of **saturable reactors** to regulate and control electric power for various manufacturing processes. The bulletin is illustrated.

Write B-623 on reply card, page 19.

"Condulets for Corrosive Locations" is the title of a new 16-page bulletin by **Crouse-Hinds Co.,** Syracuse 1, N. Y.

Corrosion-resistant properties of a variety of metals and finishes used in Crouse-Hinds **condulets** are described, with simple charts showing the applications of each.

Write B-624 on reply card, page 19.

USE PITTSBURGH STANDARD'S CONDUIT WITH HOT-DIP GALVANIZED THREADS

Forget about rust with Pittsburgh Standard's Hot-Dip Galvanized Threads. Threads stay bright, sharp, clean, no matter how long conduit stays in storage.

Zinc chromate coating both inside and out doubles the protective life of the galvanizing.

Color-coded thread protectors on all sizes help prevent size mistakes.

Every size of Pittsburgh Standard Hot-Dip Galvanized Conduit thru 6 inches has these advantages AT NO EXTRA COST.

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PITTSBURGH STANDARD CONDUIT CO.
VERONA, PA.
Plants at Verona and Morrisville, Pa.
RIGID STEEL CONDUIT
ELECTRICAL METALLIC TUBING
ELBOWS • COUPLINGS • FITTINGS

PITTSBURGH STANDARD CONDUIT CO.

NO WASTE CIRCUITS—Reduce material costs and save space. Make up exact length blocks required from 20 pre-assembled snap-fit contact sections. Merely pull off or add groups of sections as needed, — snap on end section to complete block. No unused contacts.

SMALLER INVENTORY— Only 2 different parts make any length block. Have complete production flexibility without stocking all required lengths. Avoid running out of any needed items.

MORE CIRCUITS IN AVAILABLE SPACE — Increase capacity of individual contacts and decrease jumpering by grouping two or more common wires in tubular contacts (any combination equal to 1 #22 thru 1 #8). 20 circuits only 9½" long, — contacts on 7/16" centers. Also save space lost mounting 2 or more blocks in line.

NO TERMINALS OR LUGS — Eliminate material and labor costs of lugging by using tubular-screw or tubular-clamp contacts which provide secure and highly efficient direct-to-wire connections.

NO HIDDEN CIRCUIT MARKINGS — Minimize circuit identification errors with marking areas on top of blocks, completely unobscured. Choice of integral painted, slip-in vinyl, or pressure sensitive strips.

QUICKER TO INSTALL, EASIER TO CHANGE — Hand assembled. No fixtures or miscellaneous hardware required. Use mounting screws only every 12 contacts, — screws need not be removed to add circuits. Easy to replace or add "inside" contact sections.

LOW INSTALLED COST — Countless users have proven that installed costs compare favorably with conventional sectional or one piece blocks, — regardless of price.

Conservative 750-volt rating • Flat Base or Channel Mounting
Tubular or Strap-Screw Contacts • Fanning Strips available

Tubular contacts fully approved.

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Write for Bulletin S-6

OUR COMPLETE LINE WILL SAVE YOUR TIME AND MONEY!

CEIL HEAT

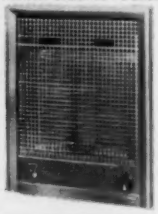
A real savings is seen when you buy all your electrical heating equipment from a single source. This, plus guaranteed quality and labor saving features assures you of more savings when you specify CEILHEAT.

The Mark of Quality in Electric Heating

RADIANT CABLES

DRI-CEIL for dry wall
ARISTOCRAT for plaster
AJAX for concrete

To meet the requirements of different types of construction, CEILHEAT manufactures 3 different electric radiant heating cables.

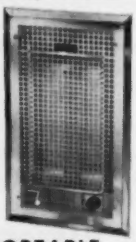


WALL UNIT HEATERS

4 sizes — 10 models — 1000 to 6000 watts — completely automatic.

BATHROOM WALL HEATERS

A 2 part unit (wall box and heating unit) — One size — 9 models — 120 and 240 Volts — 750 to 1500 Watts — Automatic or manual controls.



PORTABLE HEATERS

4 sizes (1, 2, 3 and 4 element units) — seven models — 208 and 240 Volts — 2000 to 4800 Watts — completely automatic.

BASEBOARD HEATERS

5 lengths (32" to 120") — 12 models — 120, 208 and 240 Volts — 500 to 2000 Watts — Thermostatically controlled (baseboard or wall). Additional sections: inside and outside corners, receptacle thermostat sections.

CEILHEAT manufactures the most complete line of electric heating equipment in the nation.

CEILHEAT is a registered trademark identifying only genuine CEILHEAT products.

CEILHEAT, INC.

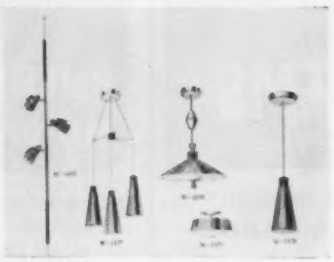
KNOXVILLE, TENNESSEE M

New products

Use of polished brass featured in fixtures

FIVE UNITS make up the Spiralite line of lighting fixtures recently announced by Moe Light Division, Thomas Industries, Inc., Louisville, Ky.

This series focuses attention on the



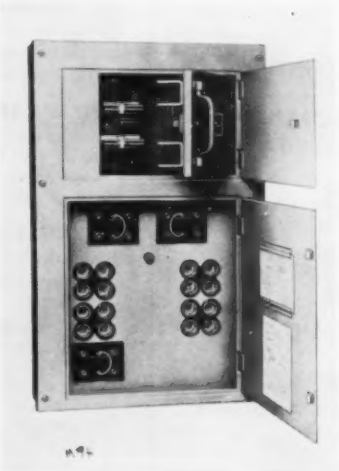
use of polished brass with concentric circles impressed around the shades, which are perforated to give a twinkling effect.

Included in the series are a pole lamp, a three-light cluster, a pull-down unit, a close-to-ceiling fixture, and a single pendant.

Write P-625 on reply card, page 19.

Main service equipment mounts directly on cabinet

NEW 200 AMPERE fusible main service equipment for the modern electric Housepower home has been introduced by Wadsworth Electric



Manufacturing Co., Inc., Covington, Ky. The solid neutral type unit is rated 120-240 volt, a-c, three-pole, two-fuse. It is mounted directly on cabinet.

The 200 ampere fusible main switch is the door operated type and controls all of the plug fuses and "Renu-fuse units." It has three "Renu-fuse units" (pull covers). Two are 60 ampere units for the range and water heater. The other is a 30 ampere unit for a dryer, etc. The "Renu-fuse units" are also horsepower rated and may be used for heaters, work shops, etc. In addition to the "Renu-fuse units," the device has 12-16 or 20 plug fuse receptacles, which may be used for 240-volt heater circuits or 125-volt lighting and appliance circuits.

The cabinet is available for either surface or flush mounting, with dead-front construction.

Write P-626 on reply card, page 19.

Entrance fitting eliminates threaded conduit need

ENTIRELY eliminating need for threaded conduit, the Speedolet all-aluminum service entrance fitting is installed by tightening the set screws.

Manufactured by Killark Electric Mfg. Co., Vandeventer and Easton St. Louis 13, Mo., the fitting is available in sizes ½-inch through four inches. The series STFB in sizes ½-inch through two inches are furnished with adapters for thinwall installation.

Write P-627 on reply card, page 19.

New finish on tube interior speeds wiring

A NEW interior finish which greatly facilitates the pushing and pulling of wires through its electrical metallic tubing has been developed by the Steel and Tubes Division of Republic Steel Corp., 224 E. 13th St., Cleveland, Ohio. It is called Silverslick and currently is being used in production of the company's "Inch-Marked" electrical metallic tubing.

It is reported that a year of testing has revealed the ease with which wires may be passed through the new tubing. Republic's knurled finish on the tube interior surface fur-

ther facilitates the wire movement.

The company's electrical metallic tubing is designed for complete protection of electrical conductors. It is made of cold rolled open-hearth steel, formed, welded, and sized by the company's Electrunite process. Intended for concealed, open, and concrete construction, it is approved by the National Electric Code.

Write P-628 on reply card, page 19.

Variety in arrangement possible with floodlights

FIVE MOUNTING arrangements are possible with a group of 24-inch diameter floodlights announced by Steber Manufacturing Co., Broadview, Ill. The enclosed aluminum

floodlights are designed for 700- to 1000-watt mercury vapor lamps. Mounting brackets include yoke for fixed wall mounting, cross arm, pipe clamp, adjustable wall, and pole top fitter units.

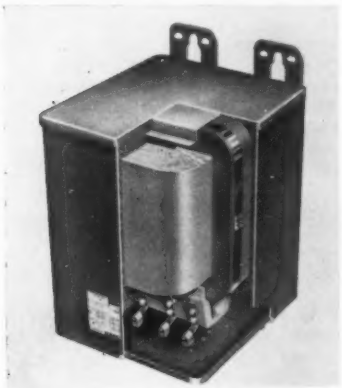
Lens are thermal shock and impact resistant. Lens ring, hinge, and clips are stainless steel.

Write P-629 on reply card, page 19.

High-voltage, dry-type transformers available

VOLTAGE RATINGS of dry-type general purpose transformers (Type EP and EPT) have been extended to the 5-kv class by Westinghouse Electric Corp., P. O. Box 2278, Pittsburgh 30, Pa. The higher voltages are available on single-phase units, 10 kva and below, and three-phase units, 15 kva and below.

These transformers, either in the 600- or 5000-volt class are particular-



Jet Line Gun Saves Hours!

New fast safe system for wiring conduit eliminates snaking!

DON'T

use a steel fish tape and spend many dangerous hours snaking it through a conduit.

Don't snake it . . . jet propel it! That's the Jet Line system in a nutshell.

A small, jet-propelled cartridge does the trick! Launched by the Jet Line Gun, it twists around ells and bends up and down as it lays a strong nylon line in the conduit in seconds. Using the nylon line, draw a foot-marked Jet Line polyethylene rope through and you're ready to pull wire.

Safe, sure and fast, the Jet Line system saves wire, money and time!

Thousands of contractors use the Jet Line Gun. Order your Jet Line Gun Kit TODAY!

DO

use a Jet Line Gun and safely jet-propel a nylon line through the conduit in seconds!

THE JET LINE SYSTEM IS SAFE!

- No powder charge — No explosion
- Both nylon line and polyethylene rope are non-conductors.

THE JET LINE GUN was invented by experienced electricians for use in rigid and flexible steel conduits, underfloor and underground ducts and cavity wiring structures. For runs up to 300 ft. . . . double this distance when launched into both ends of the run.

Ask your distributor or write

Pat. Pending on Method and Apparatus

Jet Line Gun Company

730 Seigle Ave., Charlotte, N. C.

3758

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ly suited for applications such as serving lighting loads from power circuits or to step down voltages for appliances, fans, portable tools, pumps, compressors, machine tools, and rectifiers.

Core and coils of the transformers are completely encapsulated in resin with high-grade electrical sand filler, providing a sealed unit that can be installed in hazardous areas.

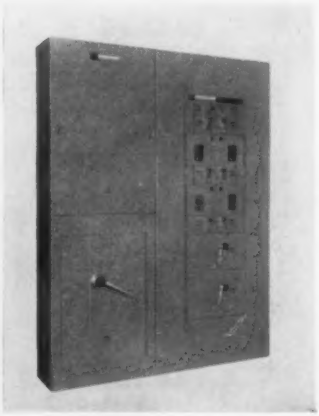
The embedment construction results in a lower sound level by suspended mass concentration and elimination of free panels. Volume is reduced by 50 per cent of previous air-insulated transformers because of reduced insulation clearances and improved heat dissipation.

Write P-630 on reply card, page 19.

Shallow-depth switchboards developed for industry

SHALLOW-DEPTH distribution switchboards developed for medium-sized commercial and industrial buildings have been announced by Federal Pacific Electric Co., 50 Paris St., Newark 1, N.J. These switchboards, which are only 14 inches deep permit the use of a variety of interchangeable distribution and control units of modular construction including Type AB circuit breakers, QMQB fusible switches, magnetic and manual motor starters, and plug-in stabreakers.

Rated up to 2000 amps, 600 volts a-c, and 250 d-c, the new units feature extra rigid construction and standardized parts. The sides of all units are constructed of two 11-



gauge formed and pre-punched channels, while rear plates are 11-guage two piece, louvered to permit ventilation.

The new switchboards have an over-all height of 90⅛ inches and their width in the incoming and distribution sections ranges from 29 to 38 inches.

Three classes of incoming and distribution units are available: one containing a panelboard section; a second equipped with a main disconnect section and space for utility metering; and a third with a panelboard section and space for utility metering.

Write P-631 on reply card, page 19.

Surface-mounted luminaires designed for commercial use

SUNBEAM LIGHTING Co., 777 E. 14th Pl., Los Angeles 21, Calif., has announced their Sculpturama Visionaire, a surface-mounted luminaire for commercial use. Curved, low-brightness, illuminated metal side panels in combination with Sunlux plastic

lens, has effectively achieved increased control in visual comfort plus new decorative possibilities in surface-mounted luminaires.

The Sculpturama #7500 Series is available for 2 or 4 rapid start lamp operation. Continuous row installation of this versatile model is achieved with use of a spacer connector which spaces each fixture and provides a spacious, convenient wireway.

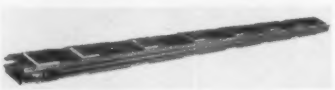
Various diffusers are provided with this luminaire for specific lighting requirements. All Sculpturama models in the series incorporate air space between the ballast mounting plate and ceiling, producing maximum thermal insulation. Radiators on "v" channel cover dissipate ballast heat for cooler operation.

Write P-632 on reply card, page 19.

Busway system designed for aluminum conductors

GENERAL ELECTRIC'S Distribution Assemblies Dept., Plainville, Conn., has announced the Type DE busway system designed exclusively for aluminum conductors. A plug-in design rated 225 to 1000 amperes, this new busway is up to 50 per cent lighter and 30 per cent smaller than other busway of comparable ratings.

This busway is available in three-wire and three-phase, four-wire designs for maximum 600-volt application in industrial and commercial



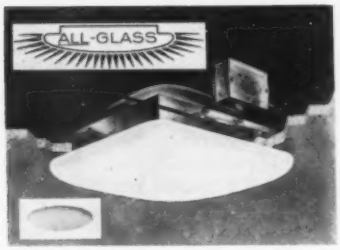
buildings. It offers as standard 50,000 amperes RMS asymmetrical (40,000 amperes RMS symmetrical) short-circuit capacity.

Type DE incorporates three new design features which help reduce installation costs. They are (1) a one-bolt joint that can be tightened with a single key-type wrench which exerts up to a ton of force on the overlapping conductors; (2) snap-on hangers; (3) an adjustable length, which allows a one-foot adjustment of a run on the job site. It also can be hung on ten-foot centers in any position, instead of the usual five.

Write P-633 on reply card, page 19.

All-glass unit combines efficiency and low cost

HALO LIGHTING Products, Inc., 3232 W. Chicago Ave., Chicago, Ill., announces the development of a recessed incandescent lighting unit called "All-Glass." It has 150 per



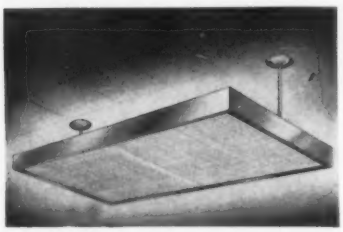
cent more luminous surface and is corrosion proof with no metal frames to rust.

"All-Glass" trims are available in 100-watt and 150-watt round sizes featuring 40 per cent greater light output. The new unit fits standard Halo Housings. It combines elegance, efficiency, and low cost.

Write P-634 on reply card, page 19.

Semi-indirect fixtures feature easy maintenance

LEADLIGHT FIXTURE Co., 800 100th Ave., Oakland, Calif., has introduced their newly developed SDLO Series of semi-indirect fixtures. The series comes in 24-inch, 48-inch, 72-inch, and 96-inch lengths. The fixtures are



available in 2, 3, and 4 lamp units—rapid start and slimline. They can be installed either singly or in rows.

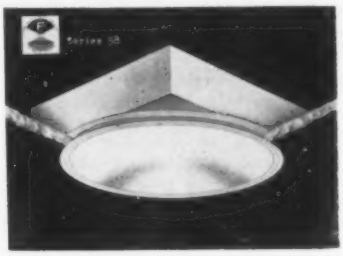
Maintenance is simplified on the new units. Instead of collecting dust, like vinyl diffusers, the dust falls through the louvre cells. They are more economical due to the "open-top" construction and due to ease of installation because of lighter weight.

The units are constructed of channel 20 ga. steel. The louvre is of ½" x ½" x ½" minicell polystyrene. All steel parts are phosphatized and finished with high gloss baked white enamel with average reflectance of .87.

Write P-635 on reply card, page 19.

Circular unit alleviates maintenance difficulties

FIXTURE SERIES 58 introduced by Frink Corp., 27-01 Bridge Plaza North, Long Island City 1, N. Y., is designed to alleviate the installation



and maintenance difficulties often associated with circular fixtures.

The new fixture has a square recessed body of 18-guage, die-formed steel. Design makes installation easier, and since only one lamp size is needed, maintenance costs are reduced.

The diffuser is ⅛-inch white translucent plexiglass. A steel circular plaster ring, welded permanently to the housing, provides an accurate form to which the ceiling material is brought. The circular door is equipped with four catches that twist-lock to the door frame within the plaster ring.

Write P-636 on reply card, page 19.

Enclosures feature dustproof construction

LIQUID-TIGHT, dustproof construction keeps all foreign matter out of pushbutton enclosures added to the line of Keystone Manufacturing Co., 23328 Sherwood Rd., Warren, Mich.

The enclosures are designed to accommodate all standard makes of oil-tight pushbuttons, switches, and pilot lights. Available in ten standard sizes for as many as 25 control units, they are supplied with or without knockouts as required.

All the 14-gauge steel boxes utilize welded seam construction and have removable flanged covers. External mounting feet are spot welded to the enclosures for either horizontal or vertical mounting. Removable covers

Koenig ALL-STEEL UTILITY BODIES

LINE-CONSTRUCTION BODY

. . . available in 9' to 14'6" lengths with mechanical or hydraulic winch and derrick, or any other special or custom equipment desired. Compartments can be arranged to your specifications.

SERVICE BODIES

. . . for ½-, ¾-, and 1-ton chassis. Electrically welded into one unit with six waterproof compartments, recessed paddle handles keyed alike and fender skirt protected with die-formed rolled edges. Built for safe, dependable service . . . will outlast several chassis.

3-WAY DUMP BODIES

DUMP to the RIGHT, LEFT and REAR

All-steel welded bodies available in 8' to 11' lengths. The multistage telescopic hoist has a lifting capacity of 25,000 lbs. This is the ideal body for safe dumping under hazardous conditions . . . especially adaptable for windrowing and backfilling.

YOU CAN BE SURE OF QUALITY MATERIALS AND WORKMANSHIP WHEN YOU SPECIFY KOENIG PRODUCTS

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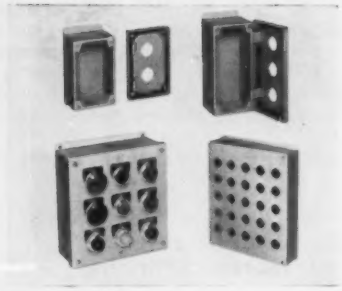

are assembled to the boxes by means of a sliding hinge arrangement which holds them in an open position when wiring the control units.

Write P-637 on reply card, page 19.

Code discussion

(Continued from page 102)

"Wiring in Ventilating Ducts. Electrical installations shall be so made that the possible spread of fire through fire-stopped partitions, hollow spaces, fire walls or fire partitions, vertical shafts, ventilating or air-conditioning ducts is reduced to a mimimum. No wiring system of any type shall be installed in ducts for dust, loose stock or vapor removal. Where it is necessary to run a wiring system through air-conditioning ducts or plenum chambers, the wiring method shall be rigid conduit, flexible steel conduit with lead-covered conductors, or Type ACL armored cable, with fittings suitable for the location. The terminals of circuits of such wiring systems shall be so located that it will not be necessary to install motors or control equipment in the ducts, except for temperature and humidity control. Raceways shall not interfere with the operation of automatic fire dampers in ducts.

"The above provisions shall not apply to integral fan systems specifically approved for the purpose.

"Consideration should be given to expansion and contraction of runs of conduit from temperature changes." (This last paragraph quoted is a fine print note following the section.)

There is some laxity in leaving holes in fire-stops and partitions, but one question which frequently comes up in connection with this section is whether lead-covered conductors are required with the rigid conduit system or just with the flexible steel conduit and armored cable systems when wiring is unavoidably run through air-conditioning ducts or plenum chambers. As it is now worded, lead-covered conductors would *not* be required with a rigid conduit wiring system. Conductors suitable for the purpose would be required. Dampness and temperature, for instance, must be considered.

The requirements for the removal of dust and vapors are usually complied with, especially if such dusts and vapors are explosive. But in other than explosive areas, a very annoying question sometimes arises as to what constitutes vapor and loose stock removal and what constitutes ventilation. This is especially true in commercial kitchens where exhaust fans, both inside and outside of ducts, remove vapors, smoke, and grease.

When the problem of wiring this sort of equipment is properly solved and adhered to, the source of a great many fires will be eliminated. Grease deteriorates conductor insulation very rapidly, and it is highly combustible. Fans used for this purpose, unless specifically approved for such locations, should have the motors outside of such ducts and attached to the fans by metal shafts or by static-proof

Universal
THIEL'S
HUMP PAT. PENDING
"NAIL-IT"
For fasteners that hold. This THIEL hump drive NAIL - IT strap has a sturdy head to insure an easy drive without bending . . . will not pull out. Zinc plating prevents rust . . . made of #8 heavy wire. Available in copper plating for plumbers use.
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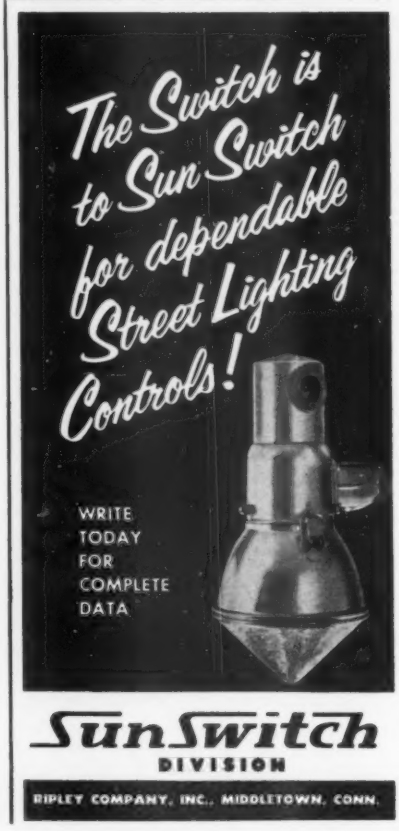
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belts. The wiring to such motors should never be installed in the ducts. (See sketch)

Answers to Code test questions: (1. **F** section 3012) (2. **F** section 3013) (3. **F** section 3013) (4. **T** section 3013) (5. **T** section 3014) (6. **b** sections 3016 and 2557) (7. **a** section 3015) (8. **a** section 3018) (9. **c** section 3023-a) (10. **c** section 3223-b).

GE comparison relay

(Continued from page 68)

squaring amplifier to the carrier transmitter. The comparer is really the heart of the phase-comparison system since its purpose, because of the signals it is given, is to compare local information with that received via carrier from the remote terminal relaying equipment. On its decision the local circuit breaker is tripped.

Know the law

(Continued from page 99)

and property by the enforcement of local regulations as to the character and quality of electrical installations.'

"The question then arises, do the challenged provisions of the Electrical Code of defendant city attempt to provide the means by which an electrical contractor with a state license may be denied the right to contract or work in the City of Los Angeles or do they come within the category of valid enactments by a municipality designed to protect property and life through the medium of local regulations as to the quality and character of electrical installations? We are inclined to the latter view.

"Appellant concedes that, 'the city has the power to prescribe the quality of electrical materials and the methods to be used for the installation of that material, and of inspection concerning the electrical installation (save in the exceptions announced in Hall v. City of Taft, 47 Cal. 2d 177 (302 P. 2d 574), and the right to collect reasonable and proper fees for inspection, and for the purpose of receipting for such inspection fees * * *.

"If defendant city is to protect itself against electrical installations inimical to life and property then surely it has a right to know who contemplates such installations. To us it clearly appears that is all Section 93.0501 requires. It provides that the state licensed contractor or his representative shall furnish the department with five simple and purely informational facts within the applicant's knowledge, and which are hereinbefore narrated. Except for the requirement that the contractor shall furnish his 'License Tax Registration Certificate number', (a business license tax, the validity of which will hereafter be considered), Section 93.0501 and its related sections here under attack, merely provide a procedure whereby the contractor can reasonably secure a permit and defendant city and its department be assured that the applicant is a person lawfully authorized by the state to do the electrical work in a manner that will not endanger the life and property of residents of the municipality. No fee is required, no bond exacted, no examination of contractor is demanded, no investigation is conducted. To summarize, no regulatory measures previously condemned in the cases relied upon by appellant are present in the provisions of the electrical ordinances here under attack. We therefore conclude that the challenged Electrical Code provisions constitute a valid exercise of the power of defendant city to establish and enforce local regulations as to the quality and character of installations by an electrical contractor who is licensed by state law."

In the same opinion, the Court of Appeal dealt with plaintiff's attack upon other provisions of the Los Angeles Municipal Code, levying license taxes upon electrical contractors. That attack, too, was unsuccessful.

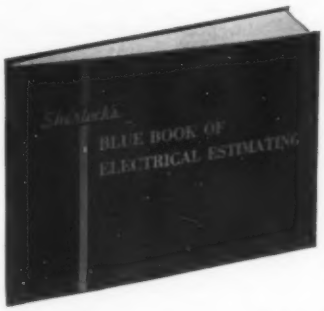
Wire cable group

(Continued from page 82)

ing needs for our products and services."

"This condition," Mr. Roscoe declared, "cannot be tolerated indefinitely. Electrical construction —all construction for that matter —is the best buy on the market today. Ours is a capitalistic economy; its vitality depends upon a profit."

Mr. Roscoe told his audience that a profit-starved company is a national liability. The problem



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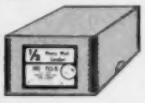

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of keeping business economically sound is something, he declared, that "has to be faced" and solutions arrived at "honestly, fearlessly and persistently."

David E. Allen, chairman of the section and vice-president of sales, Anaconda Wire and Cable Company, reported on the activities of the section during the year. These activities included a program of free mailing of wire and cable standards, a study of the import threat to the industry, and a conference with the U. S. Signal Corps regarding the disposal of surplus wire and cable production equipment, as well as the many Section Committee projects.

Allis-Chalmers unit

(Continued from page 70)

rather than tripping prematurely on the basis of the previous overcurrent. However, if the overcurrent condition becomes more severe, the relay will trip up to 1 per cent sooner.

Training of personnel to calibrate the static relay will be minimized. Calibration will be reduced to an occasional adjustment, which can be done with a standard set of instruments by technicians now trained to handle induction relays.

Calibration procedures can be greatly simplified because of the absence of moving parts. There are no moving parts other than the time and range controls. The user benefits by lower maintenance costs immediately in terms of time and skilled labor for intricate adjustments.

Relay characteristics can be easily changed from standard to very inverse. The present design of these relays includes five taps for the inverse-time unit as well as five taps for the instantaneous-trip unit.

The auxiliary current transformer is designed so that a multitude of ranges is available without altering the basic design of the relay. Thus, the user will have greater versatility in a single unit. Design features will permit conversion of one relay to another by changing its characteristic curve to meet requirements. This means less investment in stocking of relays along with simplicity of conversion.

Under identical operating conditions, the static relay will be less sensitive to frequency variation. This means that greater over-all accuracy can be obtained under fault conditions.

The entire art of relaying may be simplified because more relay functions now can be combined into one relay design. In addition, relays now can be mounted in places where the induction type could be damaged by shock, moisture, or a variety of unfavorable environmental conditions.

Transformer plant

(Continued from page 65)

completes the last test, the results are recorded automatically by punching them into the same cards that programmed the tests.

Nine transformers are tested concurrently, each receiving a different test. The automatic system not only saves time, but produces more complete and accurate test information as well as providing the operator with the ultimate in safe operating conditions.

Over-all programming and sequencing for the carousel test line is controlled by Westinghouse Cypak static controls. Some relays are used at individual test stations to control simpler operations.

Material handling portion of the system consists of a thirty-foot-diameter rotating wheel that transports the transformers through the various test stations. The wheel is completely supported from overhead and is capable of handling units weighing up to 1500 pounds each.

There are fourteen loading stations on the wheel, each consisting of a conveyor rail for supporting the transformer carrier, an automatic device to lock the carrier in position, and six electrical contacts that are connected

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to the transformer under test by coil cords.

These contacts mate with stationary contacts mounted above the wheel on its supporting framework. Since the stationary contacts are connected to the test equipment, connections to the transformers under test are automatically selected and commutated as the wheel rotates.

A portion of the circular test line is enclosed within an acoustically tested tunnel, which dampens out factory noise. In this section, sound measurements can be accurately made on each unit.

Testing of a transformer is completed every 90 seconds. This time is controlled by test standards; for instance, standards specify that overvoltage must be maintained for one minute on each unit.

Lighting substations

(Continued from page 63)

It was found that by placing these fixtures on existing structures or poles, the initial installation cost could be greatly reduced. Mounting fixtures approximately 40 foot high eliminated the problem of glare when operating disconnect switches. Bulbs of 1000 watt size in these fixtures give about 3 footcandles on the structures in the back, and approximately 6 footcandles in the front of the substation.

The cost of installation per unit was greater than the old type fixtures; however, the total cost of the lighting job was considerably less. A 200 ft x 200 ft-substation may be well illuminated by using four fixtures at a cost of approximately $1,550. This price includes a photo cell which will automatically control the lights. Under normal usage the mercury vapor bulbs will last about three years. The accompanying "before" and "after" pictures show such a substation of the Louisiana Power and Light Company from a distance of 50 feet.

Primary voltages

(Continued from page 61)

pioneering the development of this equipment.

The next level of distribution voltage (which may be some time in the future) should be 26.5/46 kv for companies which use this voltage for subtransmission. This is probably about as far ahead as one can look at the present time.

With the increase in distribution primary voltages, the higher levels of transmission voltage should be utilized to provide logical transformation ratios for distribution substations, following trends toward higher levels which are already established. It is expected that transmission voltages will continue to increase to the larger values included in the table and beyond.

Factors affecting costs

After a higher level of distribution primary voltage has been adopted (usually by conversion of subtransmission systems as discussed in the previous section) increasing usage results in lower costs for distribution equipment. The decrease in the equipment cost differential between systems in the 13.2 kv and 4 kv levels with continued expansion in the use of 13.2 kv distribution is too well known to merit discussion here.

Recent decrease in the spread between the 13.2 and 23 kv systems

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is of current interest. The chart shows the present cost relationships on a cost per kva basis. Something over a year ago the manufacturers got together on Basic Insulation Level and other manufacturing specifications and announced a lower price for the 14.4 kv transformers which are used on the system designated as 13.2/23 kv in this paper. This price reduction on transformers had the effect of bringing the 13.2 and 23 kv installed transformer costs very close together. Price adjustments within the past few weeks did not change the relative cost levels materially. Latest available prices were used in the preparation of the curves.

As volume develops, lower prices may be expected for the distribution equipment used on the 20/34.5 kv and the 26.5/46 kv systems. Price levels depend to some extent on expected volume and it seems very likely that the differential in installed transformer costs between the 23 and 34.5 kv systems which is shown in the chart will decrease materially as the 34.5 kv system attains greater usage. There is no basis for a realistic estimate of equipment costs for the 26.5/46 kv voltage level at this time.

After firm prices for equipment have been established, which are based on quantity production, a distribution voltage level begins to "stand on its own feet." If economy dictates, it will then be installed as a distribution voltage entirely and not necessarily derived by change-over of transmission facilities. This condition was reached some time ago at the 13.2 kv level. This voltage has been initiated for distribution purposes in many locations where it had not been used for subtransmission.

As regards the 23 kv system, it is believed that the time has now come for this voltage to take its place as an economic distribution system level. As it started out initially it was derived by change-over of subtransmission but several companies are now expanding the use of 23 kv distribution in new locations where it did not exist as a subtransmission voltage. Companies in the Southeast are using this voltage level and one of them is a particularly enthusiastic exponent of the advantages of 23 kv distribution.

The future of 20/34.5 kv looks very promising and it is expected that it will follow the same pattern of initial derivation by change-over from subtransmission. The fate of the 26.5/46 kv system still lies in the future awaiting the attainment of load densities which will make its use attractive.

Coordinating voltage levels

It seems evident that increases in distribution primary voltages should be paralleled by increases in the voltages of the transmission systems which serve the distribution substations. As indicated in the discussion of the 13.2 kv distribution system, voltages of 69 kv and higher have usually been utilized to serve the source substations and subtransmission voltages of 46 kv and below have usually been "frozen" and not expanded in the development of this system.

If this system development pattern is a logical one, then increases to 13.2/23 kv, 20/34.5 kv and 26.5/46 kv should be matched with step-by-step increases in transmission voltages.

As an example of the thinking of some engineers regarding future transmission and subtransmission voltage levels, reference is made to a paper by V. W. Ruskin and A. Langmuir of British Columbia Engineering Company Limited which was presented at the AIEE Winter Meeting in February, 1959. This paper shows the results of a study over a 20-year period of future power supply facilities for the city of Vancouver and vicinity. The conclusion in this paper reads as follows:

"With loads in a metropolitan area of the magnitude and distribution indicated, the superposition of a 230 kv subtransmission network with substations stepping down from 230 kv directly to 12 kv distribution feeder voltage is technically and economically superior to expanding the existing 60 kv subtransmission system. A 230 kv subtransmission system provides satisfactory voltage levels, adequate service reliability, and ability to expand in small or large stages as required to meet load growth."

It should be noted that the 230 kv system discussed is subtransmission in function and is supplemented by a higher voltage transmission system with levels in the order of 500 kv or higher contemplated for the future.

230 kv is somewhat higher than generally considered economical for subtransmission by engineers at this time but it may be indicative of the future. It would be most interesting to extend the excellent results outlined in this paper and to consider the relative economics of using the 230 kv subtransmission to supply distribution substations operating at two, three or four times the present 12 kv distribution primary voltage level. It is believed that for the load densities contemplated within the 20-year period the higher distribution voltages would show real economy.

As distribution engineers it behooves us to consider the higher distribution voltages which will correspond to the increased voltage levels planned by transmission engineers. Economy dictates the use of larger substations to step down from the higher voltage transmission circuits to the distribution level and these larger substations are quite feasible at the higher primary voltages. If the Ruskin-Langmuir paper is any indication, we may have to move fast to keep up with the passing parade.

Although completely outside the scope of this paper a comment which seems pertinent is that the time has long since passed when the United States should follow the lead of most of the rest of the world and increase secondary and utilization voltages to something in the order of twice the present levels. Full economical use of the higher primary voltages calls for larger distribution transformers which are practicable with higher secondary voltages.

Basic insulation levels

The Basic Insulation Level of a piece of electrical equipment is a measure of its resistance to impulse voltages and switching surges and may have an appreciable effect on the cost of the equipment. For distribution devices designed for operation at or near the 13.2 kv level, a BIL of 95 kv has been used for many years and has become standard. The 95 kv BIL is designated as distribution as contrasted with a higher level which is designated as power. The discussion in this paper is concerned with Basic Insulation Levels for distribution equipment designed for operation on wye connected multi-grounded neutral systems.

For the 13.2/23 kv voltage level, a BIL of 125 kv has come into use and is receiving industry recognition. It is perhaps unfortunate that on "18 kv voltage class" designation has been created for distribu-

tion equipment designed for connection to this system. Although this method of nomenclature is used for transmission systems operating at the higher voltages, it is not in accord with past distribution practice and has created some confusion among distribution engineers. It is believed that the use of the actual voltage rating of the equipment together with the BIL will be more satisfactory than the creation of a "voltage class" designation which requires interpretation to determine its meaning.

A BIL of 150 kv has been proposed for distribution equipment designed for connection to the 20/34.5 kv system. Careful consideration should be given to the final selection of a value which will provide an adequate margin of protection where properly selected lightning arresters are used. At the same time the level selected should not be so high as to increase equipment prices excessively. If the reasoning involved in the selection of 26.5/46 kv as a distribution primary voltage level for future consideration is acceptable, it is not too early to initiate consideration of a suitable BIL for the distribution equipment designed for use on this system.

The comparable transformer prices used in the preparation of the costs shown in the chart are based on the use of 95 kv, 125 kv and 150 kv for the 13.2 kv, 23 kv and 34.5 kv systems respectively. These values of BIL seem quite reasonable and are offered for serious consideration as a logical progression.

More loadability

(Continued from page 62)

ing. Degree of uprating will vary slightly with the rating.

Operating costs can be reduced with the new settings which require the same operating procedure as existing designs. Margin between light operation and breaker trip, according to the engineers, gives a logical, comfortable load-growth cushion over the entire kva range. As with present transformers, the increased light settings will enable utilities to use the light as a warning for approaching changeouts.

Hot weather trip-outs, caused in part by narrow light-to-breaker load margins on self-protected transformers built a few years ago, are avoided with the new settings which permit substantial load growth before breaker trip.

The new Melalast coating developed for the transformer covers is a thermo-setting epoxy resin modified to increase its mechanical strength and resistance to weathering. Superior to paint in insulating and protective properties, Melalast reduces service outages, corrosion and related maintenance problems, company engineers said.

Its high dielectric strength insulates the cover from accidental shorting by birds and squirrels. "Bird guards," terminal taping and line drop sleeving are not needed with the new transformer covers.

Developed especially for this type of application by the company's Pittsfield research laboratory, the plastic coating fills crevices and effectively protects the metal surface including welded seams on both main and handhole covers and their clamping bands.

Improved bushings

Cover-mounted bushings, designed so the internal fuse can be replaced without removing the bushing, will reduce maintenance time and costs at utility service shops.

A potential source of corrosion is removed and maintenance costs reduced with a new, positive method of internal clamping that eliminates several external parts. Held by a strong one-piece steel clamping ring or "holder" which fits into a groove in the porcelain, the new bushing is locked firmly in place by three set screws compressed against the inside of the transformer cover.

The bushing is free from radio noise. The bushing-to-cover locking and the terminal, which is keyed to the porcelain, provide "double-keyed" protection to keep the bushing from being turned by heavy-handed linemen.

Easy removal of the internal fuse in self-protected transformers is possible with the new bushing by: (1) reaching into the handhole and unclipping (unscrewing on units above 25 kva) the lead from its winding, (2) unscrewing and removing the terminal, and (3) twisting and lifting out the fuse assembly.

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former line is designed to reduce maintenance costs for utilities by minimizing damage to the transformer finish, floors and truck-beds from scraping.

A new red and silver nameplate made of stainless steel will be used on all the new pole-type distribution transformers for positive identification. On units 25 kva and smaller the plate is located on the lower mounting lug, eliminating an appendage (from the tank) and another potential corrosion spot.

Planning networks

(Continued from page 59)

wye, necessary meter changes are made.

4. Convert the existing 120/240 volt delta overhead system to 120/208 volts radial wye. Actually this is done one transformer bank at a time and will take place gradually. There have been very few cases where it was necessary to install autotransformers or replace heating elements due to the voltage change.

5. New and revamped services are normally served by underground cable and manholes from risers to overhead pole mounted transformer banks. The conduit and manholes are, of course, located to fit the long range network plan. The customer owns the cable and conduit to his property line.

6. As new loads of a size large enough to require a transformer vault develop, or new and revamped loads served from manholes become large enough, a transformer vault is installed. A vault may also become necessary due to physical limitations of maintaining the overhead transformers.

7. As the load densities grow on this underground system, there will be a gradual development to a network type system with more than one primary feeder and grid secondaries. This will be achieved when the cost is justified by the degree of service continuity required.

The plan for progression to underground is expected to take years to complete and it will only progress as the load densities and other factors justify it. However, our experience in other cities in Florida have indicated that this plan will enable us to build toward the future with a minimum of waste, while still deferring the costly complete underground system until it is entirely justified.

Aerial cable

(Continued from page 57)

course, easier to tap and splice; and repair or replacement time would be considerably shorter in case of a failure.

Such a cable system, based on actual total installed cost, is one-fourth the cost of a preassembled aerial cable system. The cost is still three times more than an open wire system and its future applications will be justified on the particular requirements.

There are at least six different type spacers now on the market for 15 kv cable systems. This development progress of several manufacturers must be some indication that such systems will have a definite place in future cable applications. One of the most promising uses is in the solving of difficult tree problems especially when used with the linear type polyethylene. The abrasive resistance qualities of this new insulating material are amazingly high and this combined with other improved physical properties would point to its possible use on this type cable system.

Secondary applications

The use of secondary cable was studied and tried for several years before any extensive installations were made. It was first thought that the higher reliability obtained with a "two shot" full 600 volt insulation would outweigh any cost advantage of using the triplexed service cable. However, after noting other company's experience with this type cable for secondary reviewing our own excellent operating record on services and short secondary runs, it was decided to use the triplex service cable.

The first large installation was made in 1958 in a 241 home, medium price class, subdivision which was located in a large pecan grove. A neoprene jacketed cable with 5/64" covering was used with a 1/0 ACSR neutral and messenger. The construction was on the rear property line utilizing 35' poles and open wire primary. Subsequent installations have been made in adjacent areas for ap-

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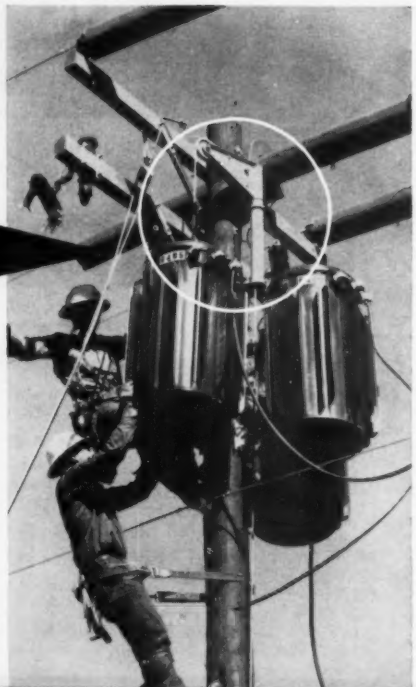

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Initial costs proved to be as low as open wire construction, and evaluating other factors such as additional capacity and reduced voltage drop, it is actually lower in first cost. The largest savings were realized in the installation costs. As this has been in service a relatively short time, no statement can be made on operating experience.

Several manufacturers' connectors and fittings were tried on these first installations. The type connections tried were found not to be comparable to the compression connectors normally used on open wire. This is especially true of the so called "black boxes" now offered by several manufacturers.

Compression connections were made at the transformer risers and thoroughly taped. They were also used on some of the service taps. Of course, the taping of these connections is expensive and if not properly applied could be a source of future trouble.

The lack of adequate connectors for this type system might deter its more extensive use despite its other advantages. Here again it appears that where an abrasion problem exists that the linear type polyethylene would be applicable.

Aerial cable, either for secondary or primary, or even better, a combination of both, offers one of the most valuable tools for modernization of an overhead distribution system.

Contractors tell how

(Continued from page 42)

tion as to whether we are ahead or behind in our labor estimate.

Labor is the largest variable in an estimate, as the reader knows. Materials are fixed if an accurate estimate is made and specifications are adhered to. Our approach is designed to tell us week by week whether we are staying within our labor estimate. We have worked out time studies of basic categories, estimating the portion of labor that went into that particular job. From the reports on time cards that mechanics turn in on the number of hours spent on conduit, wire, switches, and panels, or installation of switches and receptacles or conduit in masonry or fixture installations, we have observed how long each process takes. For example, if I know that it costs two labor hours to put in 100-ft. of x-size conduit, I can use that figure for estimates on future jobs. From such time studies we have established an average for estimating purposes as applied to commercial and industrial installations.

It is expected that a mechanic meet the averages for the whole shop. If a job took longer in comparison with jobs that established that labor figure, we can look into causes and revise standards set up.

Our estimate sheets also reveal whether our materials buying as well as labor costs has been accurate. Accurate estimating ties in with our job costs accounting system.

It is expected that each job we take should prove more profitable through accurate estimates.

NECA-IBEW meeting

(Continued from page 29)

for field reports on such interference.

Damon added that the country was searched carefully before two new members "of the type we need" were added to his staff. They are Douglas Ellis of Portland, Ore., and Joe Taylor from Local 59 in Dallas.

Marketing program

Another panel concerned itself with the NECA-IBEW joint marketing program, which, with panel members, was introduced by K. U. Benjamin of the Shelly Electric Co., Wichita, Kan. He is a member of the national marketing committee and his subject was, "What is Our Program?"

Other panel speakers were Hunter Cunningham, who used an accompanying film to exploit "The Westinghouse Build Business Electrically Plan." He is Southwest regional agency manager for Westinghouse, St. Louis.

Only other panel member to speak, of a total of five, was John F. Biggi, manager of the National Wiring Bureau, New York, with the topic, "Commercial Wiring is Off the Ground." He also utilized slides.

Jake Hamblen, president of the National Association of Electrical Distributors and a partner in the Southern Electric Supply Co., Houston, told the convention that contractor relations with suppliers are good or bad depending on the contractor.

"Team up with a limited number of suppliers and save time," he advised. "You have the inalienable right to do business with whom you choose. Every salesman who calls on you costs you time, and time is the most expensive commodity."

Hamblen said it is the distributor's function to get the factory's products to the consumer in the most economical manner, that any distributor "worth his salt" will set up product meetings for contractors, who should know their products.

"It is important for you, the contractor, to make the contact and close the deal with the customer. The man who closes the deal is the one who determines the amount of profit in the job.

"Let's talk about financing. It is well now for the contractor to know where the money is coming from before he gets the job, for distributors all over the country are getting tighter and tighter about credit. It is a question of how much financing is expected of a distributor. The place to do financing is the bank. And remember that the person who does the financing and also closes the sale makes the most money."

Inter-Industry Committee

Felber, NECA public relations assistant, filled his second assignment on the program, in the third session, with the subject, "Plans and Purposes of NECA's Inter-Industry Committee."

Gilbert F. Sweeney, who served as chairman in the final session, made a "Brief Report on the National Electrical Benefit Fund." He is business manager of local union No. 60, San Antonio.

Concluding feature of the program was the color-sound film, "Operation Brotherhood," a romanticized history of the IBEW.

Inspectors and inspections

(Continued from page 31)

tric facilities are the most important part of the building.

(2) Electricity, if handled properly, is a docile servant, a dependable servant, and a powerful servant, but if not used properly electricity may become a treacherous servant, dangerous to both life and property.

(3) Growth of the use of electricity in existing buildings has grown within our memory from serving a few lights to full lighting, air conditioning, cooking, re-

frigeration, heating, etc., and in the case of businesses to multiple power uses.

(4) Records show that the use of electricity is now doubling about every seven years.

The above statements mean that the problem of safe and adequate installations for electrical equipment also doubles every seven years. It was in the interest of safety that the first electric inspection laws were passed.

Today, our electrical inspectors are faced with a problem of keeping informed about the rapidly changing uses of electricity. Many new devices are being made which require various amounts and voltages of electricity. These changes make it necessary to provide different and new methods of wiring. In his jurisdictional area, your inspector should be the source of authority on what is adequate and safe electrically. In order to do this he must have a source of state wide and national news and views on electrical inspection problems and codes.

The only authentic source of such information to an electrical inspector is through membership and participation in the International Inspectors Association.

As a member of a chapter of the International Association of Electrical Inspectors, an inspector receives the *News Bulletin* which would supply him with the latest Code changes, interpretations, and other news affecting his work. He also receives the ELECTRICAL SOUTH, a monthly trade magazine giving latest news of the electrical industry in general.

Through his participation and attendance at the annual two-day code school held in various Georgia cities, he would have an opportunity to discuss personally, with his fellow inspectors, mutual problems and solutions. He can impart as well as receive vital knowledge at these meetings. Members of the national organization are always present at these annual meetings to give the national views on problems and developments in the industry. Recommendations are made at most meetings for changes in the Code. The association is well represented on the National Code Making Panels.

Any municipality not now providing for electrical inspections by a qualified electrical inspector should give serious consideration to the establishment of an inspection department. And every municipality that does employ an electrical inspector should encourage him to maintain membership in the inspectors' association and to attend the annual Code schools in order to maintain and improve his qualifications. Many municipalities have found that they are well justified in paying the electrical inspectors' expenses to attend these Code schools.

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Equipment displays

(Continued from page 36)

This board shows almost all the types that are available for the usual run of work, and the contractor letting the electrical contract, or the owner or architect—whoever needs to make the selection—can select the proper box from the wall display.

Here again it is an easy matter to point up the advantages of boxes of certain capacities for certain work and show in a graphic manner why it should be used. The orders are then written up from the stock numbers under each switch.

"It has saved us countless hours in talking and catalog searching," Howerton said. "Helps us sell a better job and gives the customer the why of the extra dollars."

Howerton stocks almost every type of electric bulb and fluorescent tube. These items are sold in good quantity because of his local reputation. They say that if nobody else has it, "try Howerton," and many of them try Howerton first.

Howerton has built a big display board and on it has mounted a sample of every lamp in stock. Now when the customer comes in, he can identify what he wants on the big board. This saves a lot of time in the store. The merchandise is stored back of the board.

Ordinarily an electrical contractor has little need for complicated displays but these three ideas have proved to be gold mines as time savers.

Cropping overhead

(Continued from page 25)

"Thus the stockman needs a bill of material for the specific job so he'll know what to assemble for it. This means the estimator has to go over his work again, or paying

$3.25 an hour to a mechanic just to pick out material.

"All you've got then is mounting overhead and expensive and non-productive labor nosing around the shop. It's just as easy to list the needed material for the job during the compilation of the estimate when taking off the plan. It's also *safer*, since this time-saving method means listing material prices far more accurately than by the conventional practice. Otherwise, on a $60 job, you could easily be off by $30 and more.

Itemizing job materials

"By itemizing each job's material requirements, you know your actual costs; you have itemized labor units, and you don't need to waste time repeating this bookkeeping later on should you land the job. Take an item of 1½-inch conduit on which there is a 56.3 cents per foot material price. If you were off only 10 feet, you'd be off $5.63."

In line with this reasoning, all conduit runs are taken down to the exact footage. Round numbers are avoided like the plague. When a mechanic needs 8 feet of pipe, he cuts it off and then adds the remaining piece onto the next pipe length. That way there is no accumulation of money-wasting random lengths of conduit.

Estimating is robbed of some of its overhead by using symbols like UG for underground work embracing rigid conduit. UG heads a column in which is made notations concerning the number of wires to be contained in the pipe. Thus the number of wires automatically indicates the size of the pipe, which is measured between outlets to the last foot. The notation OH (overhead) details EMT quantities.

Thus a glance suffices to tell pipe size; whether it is overhead or under slab; rigid or EMT. The number of locknuts and bushings is also automatically indicated by the totals at the bottom of each column.

Similar simple notations speed up taking off switches so the size gangboxes needed are indicated. For example, with the letter S denoting one single pole switch, the notation SS means 2 single pole switches in one box, SSS 3 in one box, etc.

This tells the size box, plaster cover and trim plate, and the number of devices. "This totaled information is immediately tendered to suppliers, and we get a quotation back in a hurry," says Grant.

Column headings like Service; Sub-Feeds, Panels, Branch Circuits, and special systems like Fire Alarm, Telephones, expedite the figuring of items taken off the plan.

Policies on foremen

"In turning over our material sheets, neither the stockman nor our mechanics know our actual job cost," says Grant. "But we feel most strongly that the job foremen know how many hours we've allotted to the job. We feel no good purpose is served by enshrouding this phase of job progress with secrecy.

"If it's a sizable contract, foremen are alerted every two weeks on the number of hours used so far and remaining. It makes them about as concerned as we are down at the office."

It also serves as the basis for a profit-sharing plan that acts as a powerful stimulus. Whatever hours are saved below the estimated time are split 50-50 with the foremen—not the men. Grant feels it is more important to grant this bonus to the foreman of the job "because the foreman can make or break the job profits."

Which brings up another point on which Grant is very talkative.

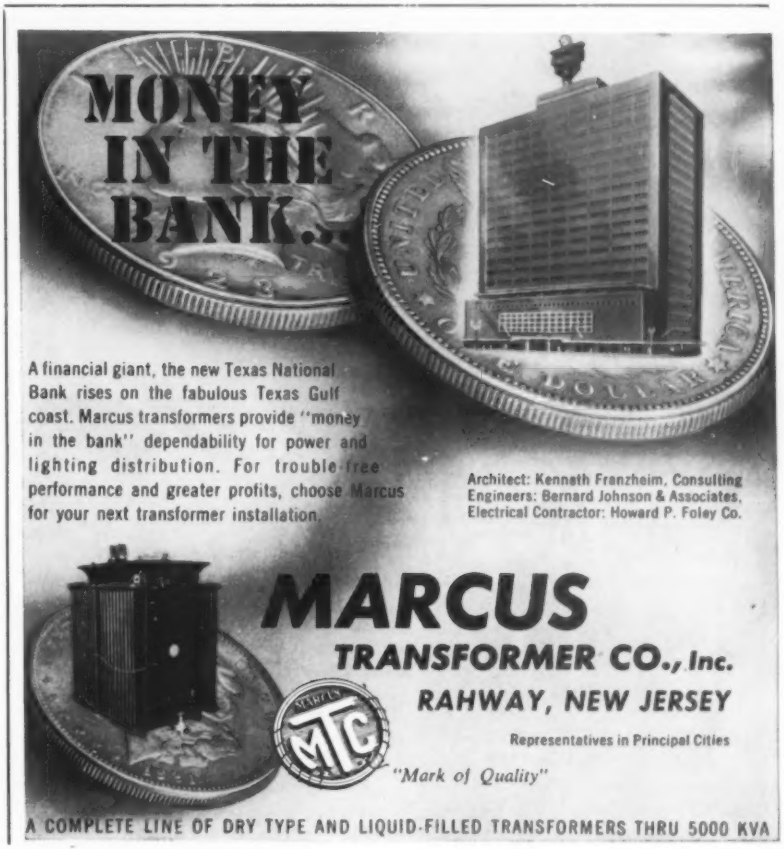
"You must make dead sure that the foremen know what is expected of the job. A liberal use of shop drawings and sketches given them is far more lucid idea than any word-of-mouth instruction and will go far in making sure there is no deviation from the planned installation.

"Shop drawings also eliminate need for making drawings on the job. It is unfair to expect labor to think every job through and also do the work. The thinking should be done in the office; labor should be expected only to perform the work.

Determining labor costs

"We can usually tell very nearly the cost of material, but labor costs are a variable in that the same good man on a different job may turn in an indifferent performance. We strive constantly to lessen our 'intangible' labor cost and make it tangible."

This is the reason Grant ascribes to his preference for compact, factory-assembled panel combinations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over individual switch groupings and troughs. He admits the factory units cost a bit more, but their cost is stable and known.

Aside from insisting that a workman who does not do a right job be compelled to repair it on his own time, thus putting a premium on good practices, Grant feels very strongly on the subject of public relations between foremen and other trades on the job.

"This is so important as to transcend, in our opinion, even the need for winning job contracts," he says. "A surly or non-cooperative foreman may incur such enmity for his firm as to hopelessly erase not only the job's profits, but to close the door to future business with a finality that might endanger the contractor's solvency as no other factor can.

"It is of the utmost importance that foremen be selected or trained in the ability to get along peaceably with co-workers."

From which it would seem that the firm's division of profits with its foremen is a formidable asset in this respect.

Another short cut Grant uses to lower overhead is his practice of listing the catalog numbers of every item so that when the stockman gets the pricing sheet, he has absolutely no doubt as to just what supplies to assemble for the job. For example, the number 54171 denotes a certain kind of outlet box, the number 54C3 denotes a plaster ring, and the number 54C1 denotes a blank plate.

These are all catalog numbers of one manufacturer so all the stockman needs to do is refer to the proper catalog when in doubt.

On devices, catalog and maker's name are listed, like "duplex receptacle, Bryant 5262," and the quantity is indicated.

Tool houses

(Continued from page 34)

Jackson Electric now has 16 such houses, built at a per-unit cost of $222.

"Each tool house built at a job site was costing us about $200," Mr. Jackson said. "So we just about evened up after one job, with the new tool house.

"One of our houses will transport enough tools and materials for an average $10,000 job. If the job is bigger, we simply use two or more houses."

The custom-built trailer used to transport the tool houses was built for $600. A pickup truck pulls the trailer.

A two-inch pipe and a railroad jack are used to load and unload the tool houses. They are set on concrete blocks. One man, Mr. Jackson pointed out, can load or unload a tool house on the trailer in less than an hour.

Mr. Jackson figures the portable units save his company as much as 5 per cent of the total cost of a job. He cites the economy of having the tool houses ready-made and having all the necessary tools and materials at the job site at precisely the hour desired.

For a recent $50,000 installation by Jackson Electric, three of the portable houses transported all the necessary tools and materials to the job site.

Mr. Jackson built five of the portable units as an experiment a year ago. He found them well worth the investment and then built the others.

Other electrical contractors in the Birmingham area recognized the practical value of the portable houses and constructed their own. Mr. Jackson lends the custom-built trailer without charge.

The Johnson tool and store-house unit is open-end and can be expanded to as many units as needed because of the bolt-up type construction.

Each unit is 8 by 10 by 9 feet, with aluminum sides and roof and marine plywood floor. Unit cost is about $150.

Bolts in the studding—base, sides, and roof—on the "open end" of the house may be removed, the wall taken off, and a similar unit bolted on to the original, doubling the original space. Sixteen bolts are used in each unit.

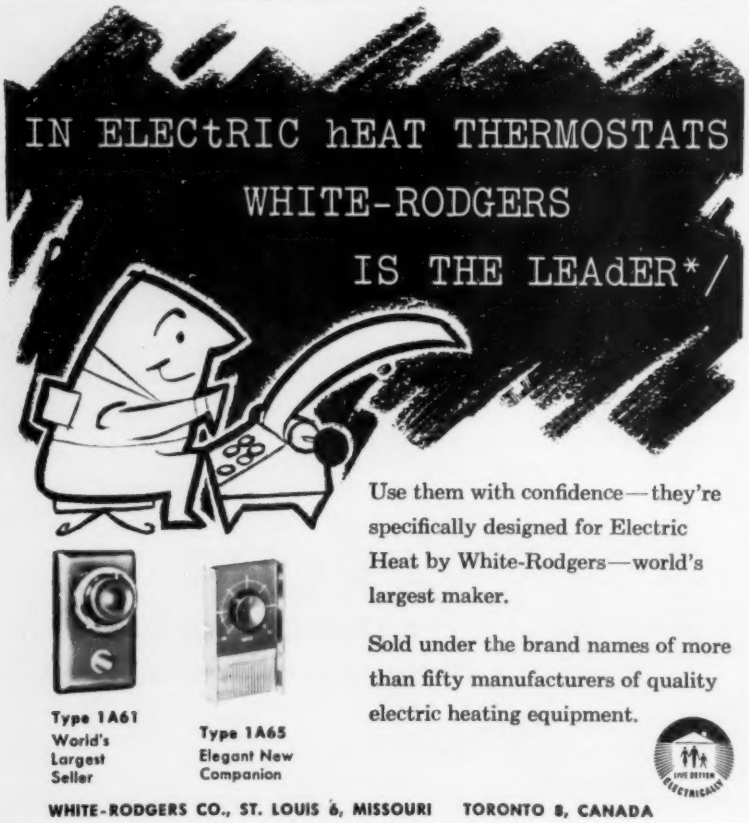
The house can be used as a store-house at the main plant, or collapsed, transported by flatbed to a job site, and used there both as tool house and field office.

Mr. Johnson said two such units can be mounted or dismantled by two men in approximately two hours.

Partnership selling

(Continued from page 33)

lems . . . and are available as systems advisors to contractors, architects, and consulting engineers on the more complex "engineered systems." Each Edwards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Evidence of success

One of the evidences of the success is the high registration of distributors personnel in the program. In the first four weeks alone distributors registered over 3,800 distributor salesmen and countermen. Another, is the fact that the Partnership Sales Program has been endorsed by all leading distributors and by officials of the distributor trade organizations.

One executive, "Ham" Corey, Graybar's Southern District Sales Manager, in Atlanta, indicated what this new plan is doing for distributors and contractors when he wrote his branch managers shortly after the program was introduced at Graybar:

"Already we have seen concrete results of our reciprocal relationship. We have encouraged our branch managers in the Southern District to cooperate to the fullest extent in assisting this program. We are urging them to carry balanced stocks and cooperate with the Edwards field representatives."

Concrete industry

(Continued from page 23)

electronic control increasingly popular in the industry.

Water is similarly controlled, as is the discharge of the finished mix into trucks. A series of jogging controls and an electric eye cut-off insures the accuracy of these operations.

Indicator lights tell the position of the tripper. There are high-low signals for each of the aggregate and cement compartments, switches to start the elevator and buttons to open the gates beneath the aggregate.

In short, the electrical contractor has produced an installation that gives Atlas Concrete a plant operating with one man, whose electronic assistance has made him a combination batcher man and dispatcher, and gives him complete control of all materials received, and the recirculating of stored materials.

Because a pushbutton nerve center cuts costs, speeds production, and controls quality, the electrical contractor has three good selling points for such a job.

In addition, as is the case of the much-larger Cone plant in Tampa, while inspection reveals that automatic batching is characteristic of many of the sizable plants producing ready-mixed concrete today, it is conceded by the concrete industry that the same efficient principles can be applied to the smaller plants like Atlas.

As a consequence, and due mainly to the uniformity of the mix assured by the electrical installation, an efficient selling campaign launched by Atlas has been expanded to boost its radius of operation to almost 35 miles from the plant.

In the case of Cone's Tampa operation, Engineer Dave Linton extolls the virtue of electronic control in a most significant and brief statement: "Before our changeover, our plant force consisted of 130 workers. Now we get a better block and 25 per cent more production with only 70 people."

Small wonder that this phase of electrical construction offers an added avenue of income and a challenge to the contractor who goes after this fast developing business.

In and around Florida, there are industrial specialists who sell the concrete-makers on the idea of automatic batching, and these firms are located throughout the Southland. Contacting these people may pave the way for a lucrative wiring plum.

Economic comment

(Continued from page 6)

now looks so bright for the next five years.

A long strike in the steel industry would create consequent unemployment in many other industries dependent upon steel as a component in their products. Thus, for a period of time, the gains noted previously in employment advance would be lost. To a lesser degree the same effect would be felt by strikes in other major industries.

On the other hand, fear of a strike by industrial leaders might well cause unwise and unwarranted acceptance of inflationary wage demands urged by labor leaders. This is necessarily a time of courage for both parties. Either action, strike or inflationary settlement terms, can well cause harm to an economic pattern of progress that is now foreseen. In other words, a settlement geared to labor productivity, and not to arbitrary demands for more money, seems the most plausible solution to a potentially dangerous problem.

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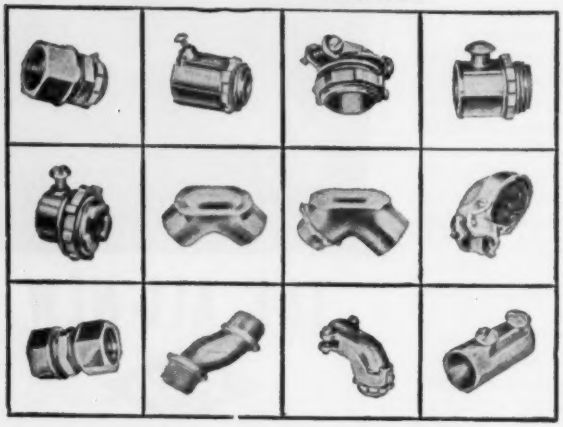

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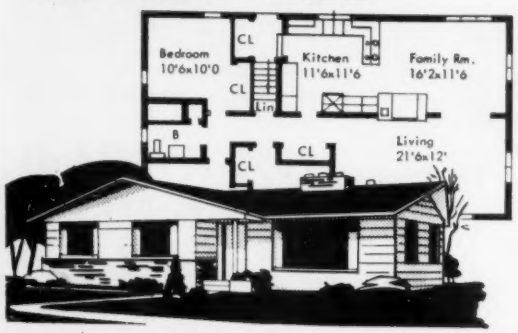

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ADVERTISER'S INDEX

A

Adam Elec. Co., Frank 8
Allen-Bradley Co. 7
Allis-Chalmers Mfg. Co. 75, 77, 79
All-Steel Equipment, Inc. 37
Arrow-Hart & Hegeman Electric Co. 98

B

Bar-Brook Mfg. Co. 105
B & C Metal Stamping Co. 49
Blackburn Corp., Jasper 92, 93
Blackhawk Industries 114
Briegel Method Tool Co. 103
Buchanan Elec. Products Corp. 117
Bulldog Elec. Products Co. 15
Bussman Mfg. Co. ..... Back Cover

C

Classified Ads 124
Carol Cable Co., Div. of The Crescent Co., Inc. ..... Second Cover
Cavalier Corporation 113
Ceilheat Inc. 118
Chance Co., A. B. 52, 67
Clayton Mark & Co. 41
Copperweld Steel Co. 16
Cross Company, W. W. 138
Curtis-All Brite Lighting Co. 4

D

Diamond Wire & Cable Co. 5
Duncan Electric Mfg. Co., Inc. 53, 54

E

Electromode Div. 130
Elliott Elec. Products Co. 124
Estimating Handbooks Associates 123

F

Fanner Mfg. Co., The 94
Fargo Mfg. Co. 81
Fast-Lok Manufacturing Company 112
Federal Pacific Elec. Co. 13
Fullman Mfg. Co. 127

G

General Cable Corp. 44, 45
General Elec. Co., Apparatus Dept. 72, 73
Greenlee Tool Co 116
Guth Company, Edwin F. 95

H

Harris Electric Mfg. Co. 125
Helwig Company 125
Henderson-Hazel Corp. 120
Holan Corp. 80
Hubbard & Co. 97
Hunter Div., Robbins & Meyers, Inc. 41

I

Ideal Industries, Inc. 105
International Oil Burner Co. 134

J

Jet Line Gun Co., Inc. 119

K

Kearney Corp., James R. 83
Keonig Iron Works, Inc. 121
Keystone Mfg. Co. 115

L

Line Material Industries 84, 85
Light & Power Utilities Corp. 17, 18
Lighting Dynamics, Inc. 1

M

Marcus Transformer Co., Inc., ... 131
Moloney Elec. Co. 87
Morrison-Pelsue Company 128

O

Orangeburg Mfg. Co., Inc. 71

P

Paranite Wire & Cable Company 35
Pass and Seymour, Inc. 133
Peerless Elec. Co. Fan & Blower Div. 109
Phelps Dodge Copper Products Corp. 88, 89
Pittsburgh Standard Conduit Co. 117

R

Republic Steel Corp. 11
Ripley Co., Inc., The 122
Rodale Mfg. Co., Inc. 66
Roebling's Sons, Inc., John A. Elec Wire & Cable Div. 50, 51

S

Sangamo Elec. Co. 91
Smithcraft Lighting Division 43
Southwire Company 55
Square D Co. ..... Third Cover
Stephens, Inc., M. 134
Superior Cable Corp. 96

T

Thiel Tool & Eng. Co., Inc 122
Thomas & Betts Co. 2
Triangle Conduit & Cable Co. 39

U

Universal Pole Brackett Corp. 46

V

Victor Specialties 124
Virden Company, John C. 9

W

Want Ads 124
Wadsworth Electric Mfg. Co. 122
Wagner Elec. Corp. 48
Wesix, Inc.
White-Rodgers Co. 132

Y

Youngstown Sheet & Tube Co. 21

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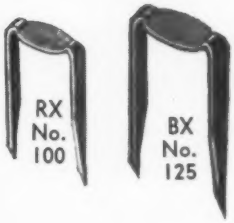

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Write for BUSS Bulletin BL-1.

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